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## Editorial

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In this issue we have a number of interesting reviews, case reports, and research from the Region of relevance to family medicine and general practitioners.

Alduwaisan, et al., looked into Mental Health program integration into Primary Health Care: Results of a Project Implemented at Yarmouk Health Care Center & Capital Health Primary Care Center, Kuwait. World Health Organization (WHO) identified a gap in meeting mental health care needs in the health services. To bridge this gap, at Yarmouk Primary Health Care Center and Capital Health District area in Kuwait, it was decided to implement a best practice model, for integrating mental health services into primary health care services in Kuwait. The program was initiated in 12 primary mental health care clinics in the Capital Health District area in Kuwait, 200 Family Physicians and General Practitioners, were trained in psychiatric integration within the primary health care system. Regular evaluation of the performance of physicians working in primary mental health clinics in the program was ensured. Periodic evaluation of psychiatric patient visits in the Primary mental health clinics was conducted for quality improvement. Mental health awareness days and educational sessions were organized. The authors concluded that with increasing psychiatric illnesses and a lack of adequate specialized mental health services, addressing this issue at the primary care level offers an attractive cost-effective option to deal with the crisis.

Alduwaisan, et al., looked at Electronic Incidence reporting impact on Quality and Patient Safety. Health care delivery was explored and paper-based incident reporting was found to compromise patient safety and quality. Induction of electronic reporting of incidents was started and its favorable outcome demonstrated. Electronic Incidence reporting was started in January 2022. A substantial increase (16 in paper-based versus 53 in electronic reporting) in Incidence reporting, following introduction of electronic reporting at Yarmouk PHCC was demonstrated. A reduction of time consumption from 35 minutes in paper-based Incidence reporting to 10 minutes in electronic reporting was demonstrated. An improvement in accuracy while using electronic Incidence report (94%) in comparison to that while using Paper based Incidence reporting (85%) was documented. Due to advancement of technology today, it is imperative and strongly recommended to use principles of quality improvement process to improve patient safety and quality of care. Electronic Incidence reporting is found to

improve quality and patient safety. Further studies into impact of better utilization of electronic Incidence reporting on health care outcomes is strongly recommended.

Mohamed1, et al., did a cross-sectional study was conducted among 279 diabetic patients attending the diabetic center in a specialized hospital in Aljouf Region, Saudi Arabia. A structured anonymous questionnaire was distributed to the targeted population during a direct interview. The present study showed that HbA1c was 77% among 86% of the participants. Regarding lipid profile, abnormal HDL, LDL, triglycerides, and cholesterol levels were detected among 39.4%, 41.2%, 68.5%, and 50.2% of the participants, respectively. Severe depression and severe family dysfunction were detected among 22% and 6% of the participants, respectively. Increasing age was associated with higher LDL levels and diabetes duration was associated with higher HbA1c levels in patients with diabetes. The study concluded that family function and depression do not directly affect diabetic patients' diabetes metabolic control and the study showed a high prevalence of uncontrolled HbA1c levels and dyslipidemia among the study participants. Further investigation into the variables underlying the control of diabetes is required to further enhance patient outcomes because many people are still failing to meet the metabolic control objectives.

Alrashidi et al., did a systematic review aims to evaluate the effectiveness of different interventions in improving medication adherence. A comprehensive search was conducted to identify relevant studies. The review included a total of 14 studies. Interventions involving tailored phone calls or educational materials did not yield significant improvements in medication adherence. The authors concluded that the findings from this systematic review suggest that interventions tailored to individual patient characteristics and involving personalized support and education show promise in improving medication adherence. However, interventions relying solely on tailored phone calls, educational materials, nurse-led care, pharmacist-led consultations, stroke physician specialist assessments, behavioral feedback, medication reviews, or motivational interviewing may not consistently improve adherence.

Alkhamous et al., did a cross sectional study to assess Vaccination Rates and Barriers in Family Medicine Practices. This study examined the demographic factors, vaccination rates, and barriers to vaccination among 385 participants.

The study found that 80% of participants expressed their willingness to take the COVID-19 vaccine. The study highlights the importance of vaccination and provides valuable insights into the demographic factors, vaccination rates, and barriers to vaccination. The findings emphasize the need for targeted interventions to address specific concerns and improve accessibility to vaccines. By addressing these barriers, public health authorities can enhance vaccine acceptance and achieve widespread vaccination coverage, thereby mitigating the impact of infectious diseases on public health. Mohamad et al., in a systematic review address the various aspects of Autism in children including clinical symptoms, evaluation, diagnosis and widely used medication or care.

Autism Spectrum Disorders (ASDs) describe a category of neurodevelopmental disorders in which individuals experience difficulties of social interaction and age-appropriate play and struggle to establish healthy peer interactions at their stage of development. The search strategy involved utilizing two primary sources for obtaining relevant literature: Google Scholar and PubMed. While children with autism spectrum disorders share many characteristics with children that have other developmental disorders and can benefit from many of the same educational strategies, they pose specific challenges for families, teachers, and others who collaborate with them. The lack of traditional friendships and peer relationships influences child motivation structures and the sense of experience. Adequate social experiences can be some of the most challenging and valuable lessons a child can learn with autism spectrum disorders.

Alotaibi et al., report on a case of neonatal tetanus in Saudi Arabia, studying the different factors lead to infection, role and protocols used in hospital in diagnosis and management of the case. A newborn 7-day old girl with poor socioeconomical status and poor a-septic delivery had been admitted to hospital with symptoms of

jerky repetitive movement and history of decrees feeding and poor sucking for one day. Laboratory tests, cranial computed tomography (CT) and lumbar puncture were performed, all of them with normal results. She was hospitalized at 12 November, 2019 in environment free of sensorial stimuli in Pediatric Intensive Care Unit (PICU), with assisted ventilation. The patient was treated with metronidazole 30mg/kg/day, ampicillin 150 mg/kg/day, and cefotaxime 150mg/kg/day.

This case indicates that non-sterile delivery by non-practical attendants are the most cause of neonatal tetanus besides, un-immunized mother against tetanus. However, in the rarest of incidence of neonatal tetanus, physicians should be prepared to suspect, diagnosis and treatment of neonatal tetanus and ensure clear and clean delivery of newborns. A combination of antibiotics and muscular relaxants are used to manage neonatal tetanus.

Alzahrani et al., followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. To determine the prevalence of pregnancy-related anxiety and its associated factors among pregnant women. A structured literature review was carried out using the component of the PICO framework. A total of 69 articles were identified through the searches, while 13 articles met the inclusion criteria. Anxiety disorders are common during pregnancy. There is wide variability in its measurement, with a subsequently wide range in reported prevalence rates. Several risk factors are associated with pregnancy-related anxiety, such as younger age, low income, past history of stillbirth, unwanted pregnancy, current comorbidity, or mental illness.

Mohamed; looked at the Effect of screen time on Children's Behaviour. As more of their leisure time is spent with screens such as iPhones, tablets, computer games, and televisions, parents, health experts, and educators are concerned about the impact of screen time on children's well-being. Excessive screen usage has a negative impact

on the verbal, emotional, and physical growth of children. Because children and teenagers are naturally drawn to screens, the idea is to teach them how to use them responsibly. Screens may help promote self-esteem and give numerous chances for learning and growth when used with good screen objectives and abilities. Children, especially those above the age of three, respond to interaction programming that is entertaining, suited to them, and stimulates imitation or participation. Dynamic video games may encourage light-to-moderate or acceptable physical exercise in the near future. Families and child care providers may include more physical activity into daily routines by using fun, age-appropriate exercise (e.g., yoga or dance) and fitness apps or videogames. As a result of these concerns, parents are being advised to limit their children's screen time on a daily basis, with particular time constraint for children and a general guideline to minimize screen time in teenagers.

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# Electronic Incidence reporting impact on Quality and Patient Safety: Results of Quality Improvement Project at Yarmouk Health Care Center, Kuwait

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## Abstract

At Yarmouk Primary Health Care Center (PHCC), a continuous quality improvement and patient safety system is in place. \

Health care delivery was explored and paper-based incident reporting was found to compromise patient safety and quality. Induction of electronic reporting of incidents was started and its favorable outcome demonstrated. This was followed by establishing a continuous quality improvement process at the facility.

Ethical principles were followed during data collection and analysis.

Electronic Incidence reporting was started in January 2022. A substantial increase (16 in paper-based versus 53 in electronic reporting) in Incidence reporting, following introduction of electronic reporting at Yarmouk PHCC was demonstrated.

A reduction of time consumption from 35 minutes in paper-based Incidence reporting to 10 minutes in electronic reporting was demonstrated. An improvement in

accuracy while using electronic Incidence report (94%) in comparison to that while using Paper based Incidence reporting (85%) was documented.

Maximum Incidence reporting was by Pharmacy followed by doctors, administration staff and laboratory. Maximum Incidences were product related followed by investigation related. No sentinel event reporting was found. The majority of reported incidences were in "no harm" and "near miss" categories. Employee satisfaction improved with electronic Incidence reporting.

Due to advancement of technology today, it is imperative and strongly recommended to use principles of quality improvement process to improve patient safety and quality of care. Electronic Incidence reporting is found to improve quality and patient safety. Further studies into impact of better utilization of electronic Incidence reporting on health care outcomes is strongly recommended.

**Key words:** Patient safety; Quality Improvement; Electronic Incidence reporting; Paper-based Incidence reporting

## Introduction

Kuwait has one of the most modern health care infrastructures, well equipped and manned by high quality human resources, distributed among primary health care centers, general hospitals and specialized hospitals and clinics(1). Primary care delivery provision is an important strategy for service delivery at public health facilities. The primary health care centers provide high quality, comprehensive and package-based services. The records and data in primary health care centers are computerized(2).

Primary health care center (PHCC) strategies in Kuwait involve expanding PHCC facilities and strengthening co-ordination between primary, secondary and tertiary health care services. PHCCs are staffed by health teams comprising physicians, nurses, pharmacists, laboratory technicians, radiology services and administrative workers(3).

Yarmouk Primary Health Care Center is an important primary care service delivery outpost, and has been regarded nationally and regionally by the WHO as an exemplary model for primary health care service provision, in the Middle East North African (MENA) zone (4).

Statistics in Yarmouk PHCC showed a decrease in number of incidence report documentation across all departments by approximately 50%. This issue was studied by the leadership team, in conjunction with the safety and risk management committee, and it was noted to have such a decline due to fear of punitive action, wavering safety culture within the organization, lack of understanding and awareness among clinicians about what should be reported and how such incidents are analyzed. Furthermore, clinicians' doubts on how such reports would ultimately lead to improvements was identified as an obstacle to clinical engagement, especially lack of systematic analysis and feedback to the staff.

In healthcare delivery services, reporting practices by healthcare workers and staff should promote a culture that helps address patient safety concerns with fairness and without fear of blame(5). It is important to ensure confidentiality of reports submitted by the employee and the sole purpose of the practice is quality improvement and patient safety. Incident reporting should ensure an organized approach to report near misses or adverse events for quality improvement and patient safety (6).

In order to serve its purpose, incident reporting practice should be voluntary, anonymous, and confidential, preferably based on an efficient electronic system. It should freely allow the reporting of incidents and adverse events for analysis, for quality improvement and patient safety(7, 8, 9). Incidence reporting has its own limitations. Reports can be subjective and therefore unfair, are not comparable between hospitals, and may be biased. Such limitations should always be considered while dealing with such reporting (10,11).

Incidence reporting electronically has been shown to be convenient for busy health care providers and staff and improves incidence rates in health care delivery service(12). It has been shown that electronic approaches to streamlining the use of adverse event reports can be used to improve patient safety(13).

At Yarmouk PHCC, it was considered that improving incidence reporting by making the transition from paper to paperless documentation, could play a major role in improving patient safety; allowing frontline clinicians to have a facilitated access for reporting incidents, which are to be handled in a non-punitive manner. Data was collected to study the impact of electronic incidence reporting on quality improvement and patient safety.

## Methodology

**Design:** Descriptive analytical study of incidents reported from 1st of January to 15th of December, 2022 at Yarmouk PHCC, using incidence report registration application.

Quality improvement tools, such as PSDA, fishbone and root-cause analysis were used to implement electronic reporting. It encourages the staff to register all the incidence reports easily and efficiently, and decreases staff time and efforts due to automatic analysis. It allowed description of the epidemiology of patient safety (PS) incidents registered in an electronic notification system, at Yarmouk primary care (PC) health center. It assisted in defining a risk map to identify the critical areas where intervention is required.

### Setting:

- **Creating a process-workflow map:** Information was recorded and noted as soon as the staff entered data regarding the incidence report. It was crucial to map the entirety of the incidence report registration, in order to clearly outline and predict how much paperwork was used. This is so that the entire task could be subsequently automated.

- **Procuring the required hardware and software:** All existing records were scanned in order to build a paperless system for incidence report documentation. Such records include data from various healthcare domains (general practice clinic, walk-in clinics, family practice clinics, appointment clinics). Data from departments like diagnostic labs, pharmacy, vaccinations, imaging unit, and administration was collected.

- **Implementing the EMR (Electronic Medical Records) System:** To automate the entire workflow and transition into a paperless environment, software for creating the EMR were obtained and operationalized.

- **Giving Staff Training:** To avoid a vicious cycle of lack of incident report documentation, staff training is of peak importance. This training involved the use of the new system for both, entering and retrieving, patient information, and abiding by the principles and high standards of the center to complete such tasks with the utmost accuracy and correctness. Training was provided on a periodic basis for existing staff, to update the staff on any technological

advancements and new practices, as well as induction training for newcomers on a more regular basis.

**Participants:** All employees across all departments working in Yarmouk Health Center from January to December, 2022.

**Data recorded:** Data was obtained from records voluntarily submitted to an electronic, standardized, and anonymized form. (Healthcare unit, notifier, type of incident, risk matrix, causal and contributing factors, preventability, level of resolution and improvement actions.)

**Measurements:**

- To measure the increase in incident reporting in all departments in Yarmouk Health Center
- To measure real-time completion of all patient and practice management-related information
- To measure the ease of access and accuracy by the staff for documenting Incidence Report
- Cost saving and improved work efficiency for better root cause analysis and quality improvement project implementation, Ministry of Health Quality and Accreditation Directorate Form-1 was used

**Quality Improvement (QI) Plan**

1. Formation of Quality Improvement team
2. Baseline data collection
3. Finalizing goals and work plan
5. Make training schedule for staff
6. Implement training based on the operational plan
7. Report training results
8. Implementation of the operational plan in all departments
9. Print and distribute posters
10. Safety culture promotional event every three months
11. "Safety responsibility" award every month
12. Include the operational plan in new staff orientation booklet
13. Audit and Data collection
14. Data analysis
15. Discussion of results and taking corrective actions
16. Regular reporting of data analysis and corrective actions

## Results

A total 16 Incidence reports were generated through manual method, between January to July, 2022, at Yarmouk Primary Health Care Center. Electronic reporting of adverse events started in June, 2022 at the Center and a total of 53 adverse events were recorded till first week of December, 2022. (Figure 1)

Time consumed in generating Paper based Incidence report was 35 minutes in comparison to 10 minutes with electronic reporting, a saving of 25 minutes per report. Reporting accuracy was 85% with paper-based reporting in comparison to 94% with electronic reporting. (Figure:2)

Department wise reporting showed 14 reports through paper-based system in comparison to 55 reports generated electronically. Maximum reports were generated by Pharmacy followed by Doctors, Administration staff and laboratory. Substantially more reports were electronically generated in comparison to paper-based. (Table1)

Maximum reports generated were related to products (25) followed by investigation related (10), medical record related (8), Clinical/Surgical (8) and device related (8). No sentinel events were reported. Events reported fell in No harm, adverse event, near miss and unsafe categories among 25, 16, 14, and 14 incidents. (Table 2)

A much higher employee satisfaction was reported with electronic incidence reporting system. (Figure 3)



Figure 1: Monthly incidence reports documented

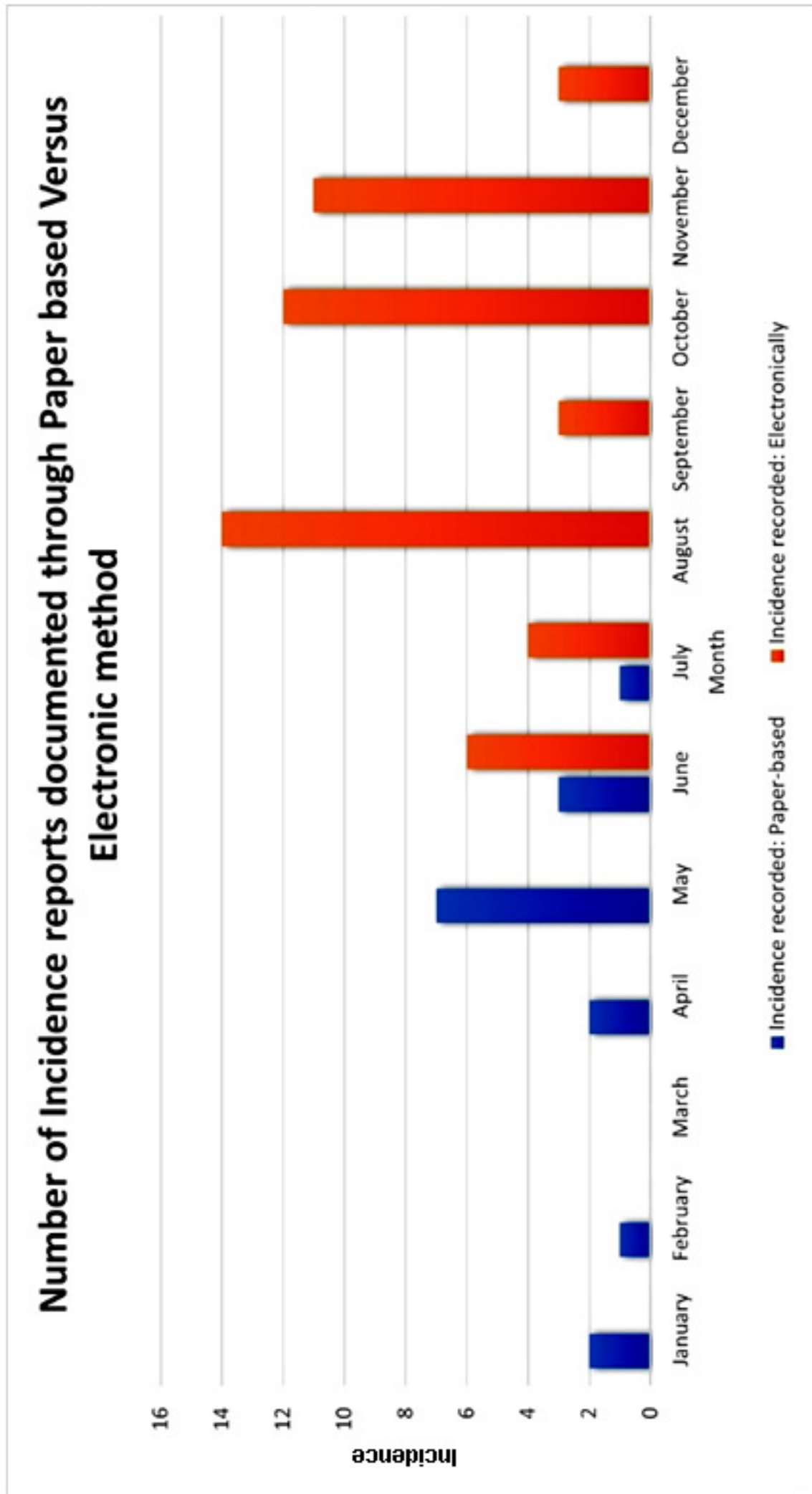


Figure 2: Accuracy vs Recording time

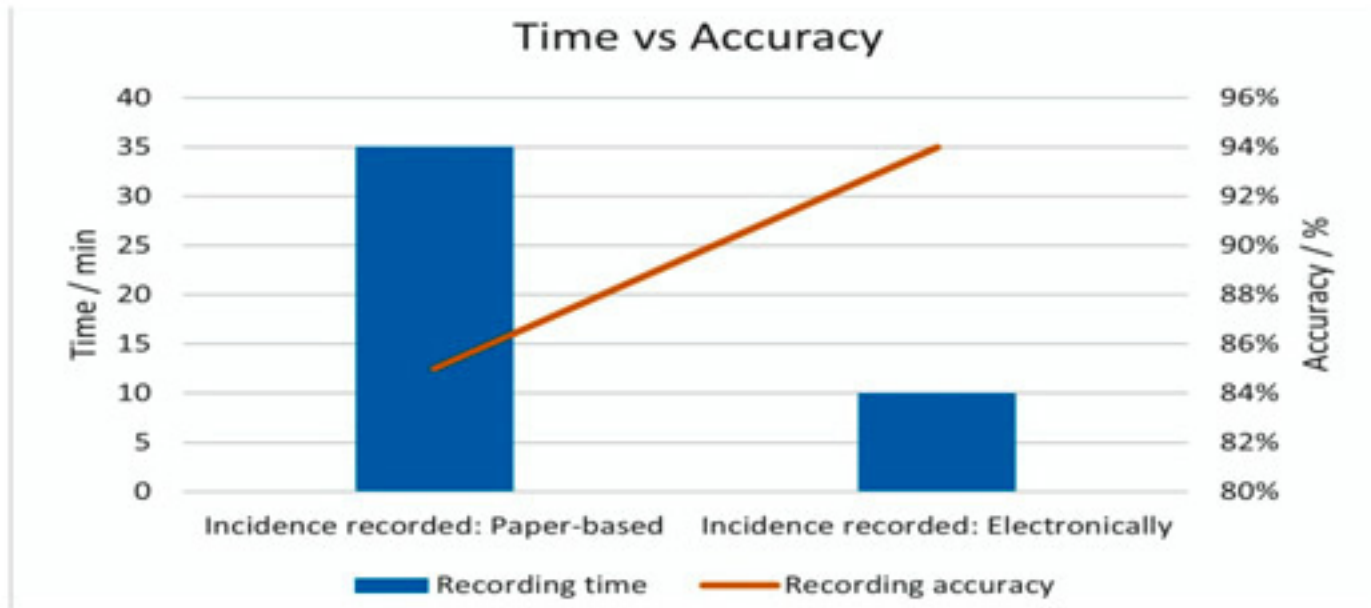


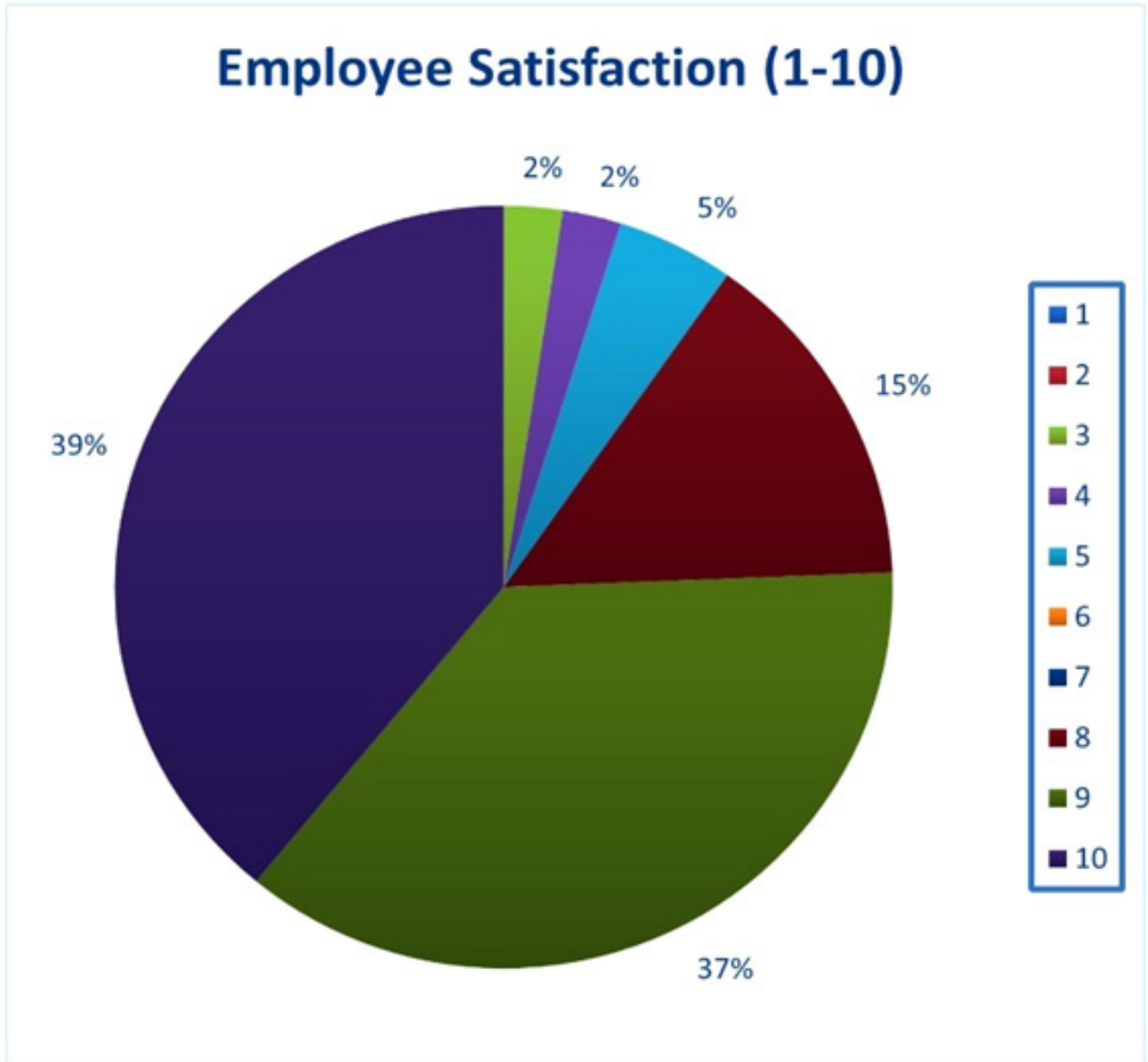
Table 1: Number of Incidence reports documented in each department

Recording Category	Incidence recorded: Paper-based	Incidence recorded: Electronically	Total	%
Doctors	4	10	14	20
Dentist	0	5	5	7.2
Nurse/Preventive medicine	1	3	4	5.8
Laboratory	2	8	10	15
Pharmacy	6	19	25	36
Administration staff	1	10	11	16.9
Total	14	55	69	100

Table 2: Nature and Type of Event related to Incidence reporting

Nature/Type of Event	Number
Administration related	4
Medical record related	8
Clinical/Surgical	8
Decubitus Ulcer	0
Investigation related	10
Product related	25
Device related	8
Patient behavior related	2
Environment related	4
Sentinel event	0
Adverse event	16
No harm	25
Near Miss	14
Unsafe condition	14

Figure 3: Employee satisfaction on a Scale of 1-10



## Discussion

Patient care is increasingly becoming technology dependent and with favorable impact on health outcomes (14). Adverse events in health care are a major concern with regards to patient safety. Paper based Incidence reporting has been in practice for a very long period but with advent of electronic technological advances, electronic recording of Incidence report has gained popularity and with good patient safety outcomes. There is evidence of under-reporting of adverse events, which needs to be addressed and improved. It is recommended that data sources including patient complaints databases and electronic medical records should be linked to the national reporting system (15).

We have found a substantial increase (16 in paper-based versus 53 in electronic reporting) in Incidence reporting, following introduction of electronic reporting at Yarmouk PHCC. We have also found a reduction of time consumption from 35 minutes in paper-based Incidence reporting to 10 minutes in electronic reporting. Time saving through introduction of electronic Incidence reporting will free time of Health Care Providers and Staff to attend to other patient care needs.

According to our data, there is improvement in accuracy while using electronic incidence report (94%) in comparison to that while using Paper based Incidence reporting (85%). Improved accuracy in reporting incidence electronically will help achieve better patient safety and improve patient care quality. In health care today, high-quality data are not only important for patient care, but are also vital for improving overall quality of health care services and better decision making envisioning effective guidelines and health care policy (16).

It is important to collect Incidence reporting according to departments. We found maximum Incidence reporting by Pharmacy, followed by doctors, Administration staff and laboratory. This is an area that requires further exploration. Pharmacy is directly concerned with adverse drug reactions and drug interactions. Maybe that is the reason why Pharmacy has reported the maximum incidences. Departments that are reporting less Incidences should be scrutinized and motivated to keep a close watch on incidences and patient safety.

It is interesting to note that maximum Incidences were product related followed by investigation related. It's important to explore these findings further and ensure patient safety and improved quality. It is heartening to note that our data did not find any sentinel event reporting. It is again important to note that the majority of reported Incidences were in no harm and near miss categories. It is also important to note improved employee satisfaction with electronic reporting of incidences at Yarmouk PHCC. This will result in better participation by the employees and with favorable impact on patient safety.

Our data shows overall acceptability and improved reporting of incidents using an electronic reporting system. There are limitations in our data as it cannot be generalized and impact of better utilization of electronic reporting of incidence on health care outcomes need to be documented.

It is important to have further discussion and debate on these findings in Quality Assurance and improvement Committee at the Yarmouk PHCC.

## Conclusion

At Yarmouk PHCC, we have documented effectiveness of a well-planned and executed quality improvement project. All steps of the quality improvement project were followed with a favorable outcome. Overall acceptability and improved reporting of incidents using electronic reporting system was demonstrated. With advancement of technology today, it is imperative and strongly recommended to use quality improvement projects to improve and ensure patient safety and quality. Further studies into impact of better utilization of electronic reporting of incidence on health care outcomes is strongly recommended.

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# Metabolic Control and Its Correlates among Diabetic Patients in Aljouf Region, Saudi Arabia: A Cross-Sectional study

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## Abstract

**Background:** Throughout the world, diabetes, and its consequences, constitutes a serious problem for public health. Metabolic control can reduce the risk of diabetes complications. The present study aims to determine diabetic metabolic control among diabetic patients in the Aljouf region, Saudi Arabia, and its association with family function, depression, and other sociodemographic and clinical data.

**Methods:** A cross-sectional study was conducted among 279 diabetic patients attending the diabetic center in a specialized hospital in Aljouf Region, Saudi Arabia. A structured anonymous questionnaire was distributed to the targeted population during a direct interview.

**Results:** The present study showed that HbA1c was  $\geq 7\%$  among 86% of the participants. Regarding lipid profile, abnormal HDL, LDL, triglycerides, and cholesterol levels were detected among 39.4%, 41.2%, 68.5%, and 50.2% of the participants, respectively. Severe depression and severe family dysfunction were detected among 22% and 6% of the participants, respectively. Increasing age was associated with higher LDL levels and diabetes duration was associated with higher HbA1c levels in patients with diabetes.

**Conclusion:** The study concluded that family function and depression do not directly affect diabetic patients' diabetes metabolic control and the study showed a high prevalence of uncontrolled HbA1c levels and dyslipidemia among the study participants. Further investigation into the variables underlying the control of diabetes is required to further enhance patient outcomes because many people are still failing to meet the metabolic control objectives.

**Keywords:** Metabolic control; Depression; Family function; Diabetes mellitus; Saudi Arabia

## Introduction

Diabetes mellitus (DM) is a critical and complicated metabolic illness, and over the recent decades, its prevalence has increased to epidemic levels (1). Diabetes is currently on the political agendas around the world due to its severe effects on a variety of levels, including the personal, social, and healthcare systems. It is crucial to slow down its epidemic curves and risk factors (2). The prevalence of type 2 diabetes mellitus in the Kingdom of Saudi Arabia has risen markedly in recent years. It is estimated to approach 40.37% in 2025, and 45.36% in 2030 (3). In KSA, the incidence of diabetes is rising due to marked growth, aging, civilization, and emergent incidence of weight problems and lack of physical activity (4).

In Type 2 DM, metabolic management is a crucial part of diabetic care. Without solid metabolic management, problems may occur that impair quality of life and raise mortality rates. Additionally, several comorbidities, such as dyslipidemia, hypertension, and obesity are linked to poor metabolic control as measured by HbA1c, high-density lipoprotein (HDL), low-density lipoprotein (LDL), total cholesterol (TC), and triglycerides, raising the risk of long-term macro and micro-vascular problems (5).

In the Middle East and North Africa, 1 in 6 adults (73 million) is living with diabetes, and the number of adults with diabetes is expected to reach 95 million by 2030 and 136 million by 2045 (6). In addition to the negative effects on health and budget, DM presents both social and psychological concerns (1). It is not fully understood why depression worsens glycemic control, but it does. It might, however, be connected to how diabetes patients' self-care activities are affected by sadness. Evidence supports the idea that depression may contribute to and speed up diabetes problems (7). The American Diabetes Association strongly emphasizes helping persons with type 2 diabetes identify, treat, and manage depression (8). Early detection, regular screenings, and the application of evidence-based strategies to depression treatment can enhance HbA1c, cholesterol, and physical well-being while lowering medical expenses (9).

The family function is defined as "the ability of families to coordinate and adapt to the changes throughout life, resolve the conflicts, cooperate between members and success in disciplinary patterns, respect the boundaries between individuals and respect the rules and principles which help the family to protect the entire family system." (10). Family is therefore a key source of social support in the daily management of diabetes (2). Diabetes is a chronic illness that affects many areas of one's life and is challenging to manage without the help of family and community. Patients' general lifestyles must modify for the better in order to manage this chronic illness (11). Despite improvements in diagnosis and therapy, many patients continue to have insufficient blood glucose control. In type 2 diabetes patients, contact between adult patients and families, perceived support from family, and family barriers are related to self-management and HbA1C levels (12).

Planning special meals, checking blood sugar frequently, reminding patients to take their medications, and maintaining exercise schedules are all ways that well-balanced families support their patients. As a result, patients' glycemic control is improved, the onset of complications is delayed, and their general health is improved. Patients with diabetes are vulnerable to several life changes that affect their psychological well-being and social interactions. The adverse effects of blood glucose-lowering medications impact patient behavior and quality of life (13).

Little data is available regarding the role of the family in improving the mental health status of patients with DM in Saudi Arabia. Also, few studies have addressed family function as a correlation to diabetes mellitus. Therefore, we conducted this study to determine diabetes metabolic control, as measured by HbA1c, HDL, LDL, total cholesterol (TC), and triglycerides among diabetic patients in Aljouf, Saudi Arabia. In addition, the present study will explore the association of diabetes metabolic control in these patients with family function, depression, and other sociodemographic and clinical data.

## Materials and Methods

### Study design and setting

This is a cross-sectional study conducted in the Aljouf Region of the KSA, situated in the Northern part of Saudi Arabia. The sample was recruited between January 2021 to August 2021 from diabetic adults attending the diabetic center in King Abdulaziz Hospital situated in Aljouf City, the capital of the Aljouf region.

### Sample size estimation and sampling method

The sample size calculation was done using  $n = P(1-p) z^2/d^2$  assuming the prevalence of depression as 20.6% (14).  $Z = 1.96$  and  $d = 0.05$  and applying to a confidence level of 95%. The calculated sample size was 251. The sample size was raised to 279 after adding 10% as a non-response rate. A systematic random sampling technique was adopted in the present study to select cases. The total number of diabetic patients attending the diabetic center in King Abdulaziz Hospital was 1450 and the sample size was 279. Therefore, the sampling interval was 5.2. The case was selected for every 5th patient if it fulfilled the inclusion criteria.

### Inclusion and exclusion criteria

The present study included males and females aged 18 years and above with type 2 diabetes mellitus for more than one year and attending the diabetic center. The participants who were not willing to participate and those who had a history of debilitating illness, current psychiatric problems, or a history of substance abuse were excluded from the study.

### Ethical consideration

The study was done with the approval of the local committee of Bioethics at Jouf University, Saudi Arabia (reference number 11-07/41). Further approval was

taken from the local committee of research ethics in the Northern Border region registered with the National Bioethics Committee No. (H-09-A-51) (reference number 691498). The objectives of the study were clarified to the participants and written informed consent was provided from participants who decided to participate in the study. The participants had the right to withdraw at any time if they decided to. By using anonymous questionnaires, the authors guaranteed the privacy and confidentiality of the data obtained.

### Data collection method

A structured, anonymous questionnaire was used in the present study. The questionnaire consisted of five parts. The first part was about sociodemographic data (age, sex, marital status, educational level, occupation, and monthly income). The second part inquired about clinical data (Duration of diabetes and Type of treatment). Assessment of depression was in the third part of the questionnaire and done by using the Patient Health Questionnaire PHQ9 (15). It is a predesigned validated questionnaire with a sensitivity of 88% and a specificity of 88%. Cronbach's alpha was 0.826. The questionnaire consists of nine questions and the results are divided into no depression (0-4), mild (5-9), moderate (10-19), and severe (20-27). The fourth part was about family function assessment and was done using SMILKSTEIN'S FAMILY SYSTEM APGAR ITEMS (16). It consists of five questions that assessed a member's report of satisfaction with five parameters of family function: adaptation, partnership, growth, affection, and resolve. The results are divided into highly functional (0-3), moderately dysfunctional (4-7), and severely dysfunctional (8-10). These four parts of the questionnaire were filled in by direct interviews with the patients. The fifth part of the questionnaire was the laboratory investigations obtained from medical records recorded approximately in the previous 3 months (HbA 1C, HDL, LDL, Cholesterol, triglyceride). Diabetes metabolic control was assessed by these parameters. It was collected from records during the same session of the interview. A pilot study was done to assess the questions' relevance to the work's aim, determine whether the respondents understood it, and determine the time needed to complete the interview.

### Statistical analysis

Analysis of data was done using the SPSS program, version 24 (SPSS Inc., Chicago, IL, USA). Qualitative data was displayed as numbers and percentages while quantitative data was as mean and standard deviation (SD). Linear regression was done to investigate the correlates of metabolic control. A p-value  $\leq 0.05$  was considered statistically significant.

## Results

Table (1) describes the sociodemographic and clinical data of the respondents. The present study included 279 participants with a mean age of  $51.73 \pm 9.12$ . Most of the participants were females (57.7%), married (81.4%), and working (43.4%). Nearly half of the participants (49.1%) have income less than 5000 RS. Concerning clinical characteristics of the respondents, 36.6% have diabetes with a duration of more than ten years with most of them using oral therapy (47.3%). Table (2) summarizes the mean values of the studied population's glycemic control and metabolic markers. HbA1c was  $\geq 7\%$  among 86% of the participants. Regarding lipid profile, abnormal HDL, LDL, triglycerides, and cholesterol levels were detected among 39.4%, 41.2%, 68.5%, and 50.2% of the participants, respectively. The study revealed that 35% of the participants have no depression. Mild, moderate, and severe depression was detected among 24%, 19%, and 22% of the studied population (Figure 1). Figure 2 revealed that 70% of participants were found to be highly functional. Only 6% suffered from severe family dysfunction and 24% from moderate dysfunction. Table (3) shows a linear regression model demonstrating the predictors of metabolic control among diabetic patients. Increasing age was associated with higher LDL levels. Diabetes duration was associated with higher HbA1c levels in patients with diabetes.



**Table 1: Sociodemographic data and clinical characteristics of diabetic patients in the Aljouf region, Saudi Arabia**

<b>Variables</b>	<b>No. (%) n= 279</b>
<b>Age</b>	
≤40	44 (15.8)
>40	235 (84.2)
Mean ± SD (Range)	51.73±9.12 (33-79)
<b>Sex</b>	
Male	118 (42.3)
Female	57.7 (57.7)
<b>Marital status</b>	
Single	5 (1.8)
Married	227 (81.4)
Divorced/widowed	47 (16.8)
<b>Education</b>	
Illiterate/Read and write.	61(21.9)
Primary/Preparatory/Secondary	111(39.8)
University/postgraduate	107 (38.4)
<b>Occupation</b>	
Working	121(43.4)
Not working	91(32.6)
Retired	67 (24.0)
<b>Income</b>	
<5000 RS	137 (49.1)
5000-7000 RS	71(25.4)
>7000 RS	71 (25.4)
<b>Diabetes Duration</b>	
≤ 10 years	177 (63.4)
>10 years	102 (36.6)
<b>Medication regimen</b>	
Oral	132 (47.3)
Insulin	78 (28.0)
Both	69 (24.7)

Table 2: Glycemic control and metabolic markers values of diabetic patients in the Aljouf region, Saudi Arabia

Variables	No. (%) n= 279
<b>HbA1c</b>	
<7 % (controlled)	39 (14.0)
≥7 % (uncontrolled)	240 (86.0)
Mean ± SD	8.66 ± 1.85
<b>HDL</b>	
≥ 1.05 mmol\L	169 (60.6)
< 1.05 mmol\L	110 (39.4)
Mean ± SD	2.64±1.52
<b>LDL</b>	
≥ 2.60 mmol\L	115 (41.2)
< 2.60 mmol\L	164 (58.8)
Mean ± SD	3.08±1.98
<b>Triglycerides</b>	
≥ 1.70 mmol\L	191 (68.5)
< 1.70 mmol\L	88 (31.5)
Mean ± SD	20.87±4.68
<b>Cholesterol</b>	
≥ 5 mmol\L	140 (50.2)
< 5 mmol\L	139 (49.8)
Mean ± SD	17.95±4.16

Figure 1: Prevalence of depression among diabetic patients in the Aljouf region, Saudi Arabia

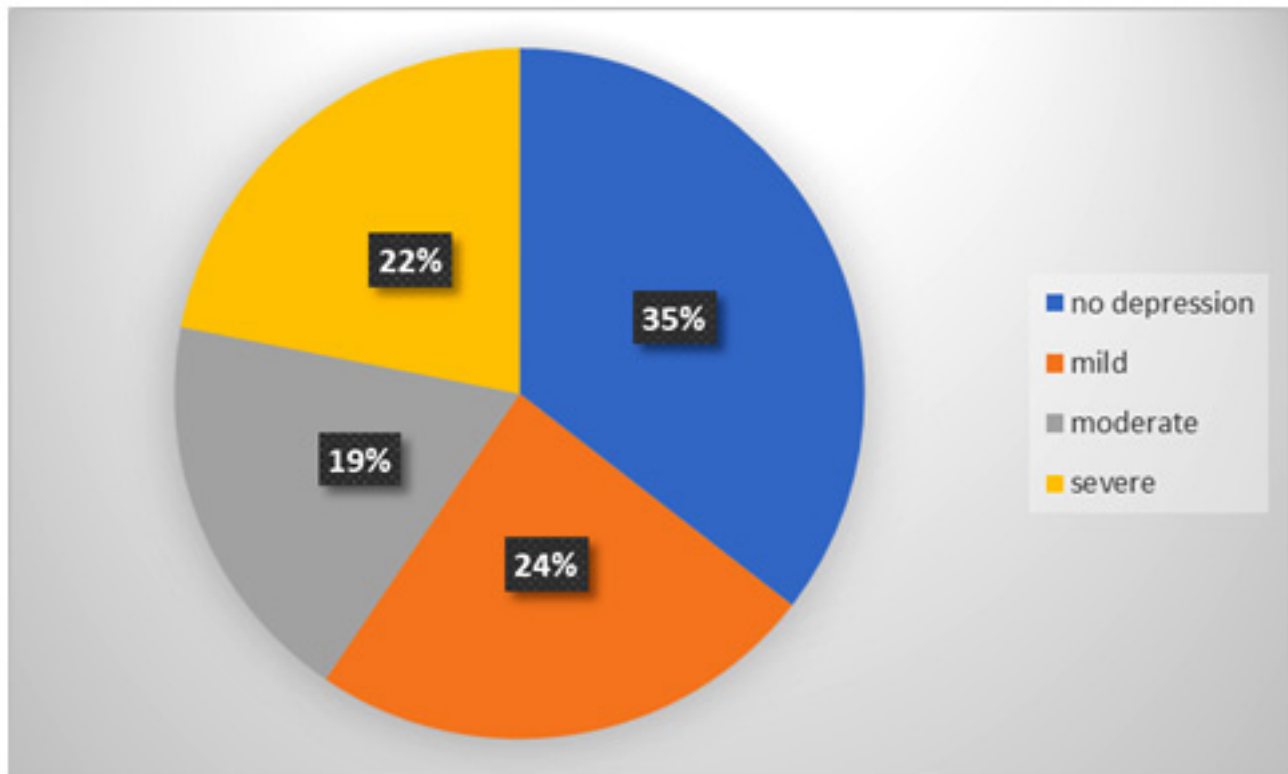
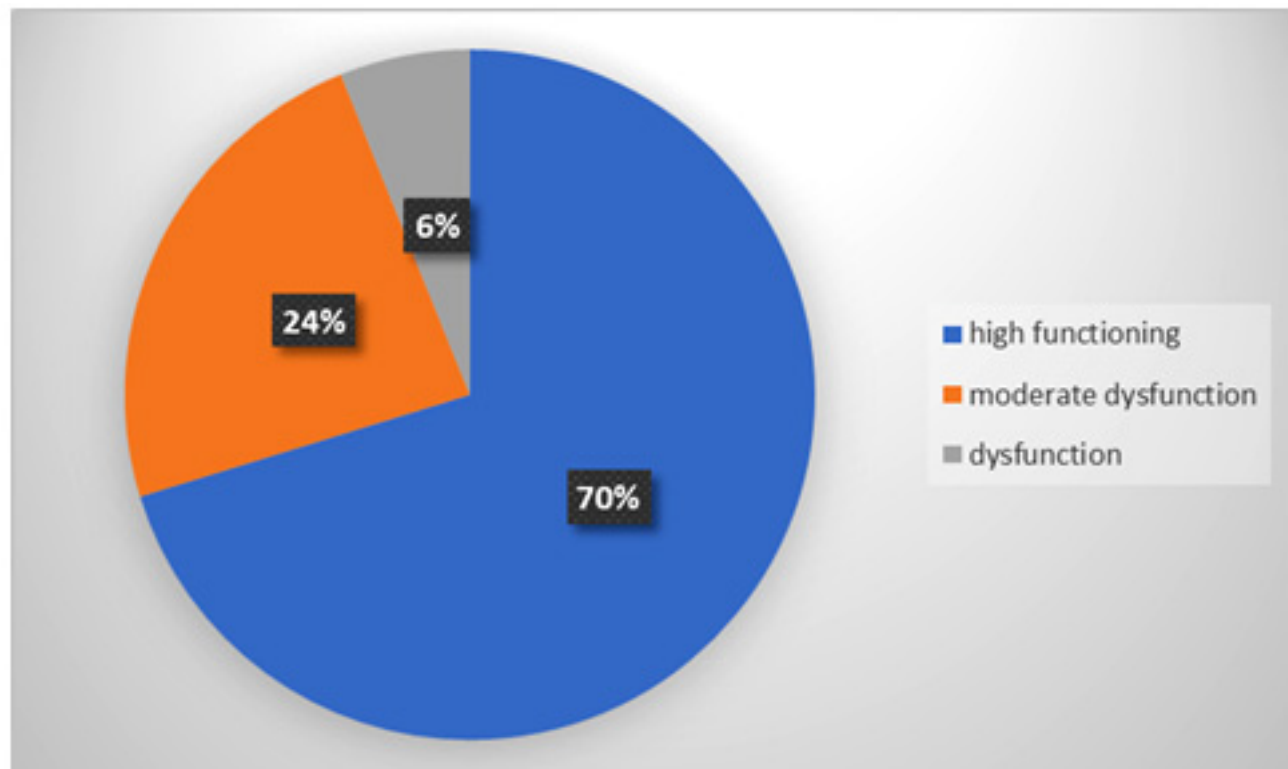


Figure 2: Distribution of family function/dysfunction among diabetic patients in the Aljouf region, Saudi Arabia



**Table 3: Linear regression model showing the predictors of metabolic control among diabetic patients in the Aljouf region, Saudi Arabia**

Variables	B	t	p-Value	95% Confidence Interval	
				Lower Limit	Upper Limit
<b>HDL</b>					
Depression	.118	1.849	.066	-.015	.475
Family Function	-.071	-1.126	.261	-3.766	1.026
Age	-.033	-.463	.643	-.217	.134
Diabetes duration	-.026	-.358	.721	-3.976	2.753
Gender	-.080	-1.282	.201	-4.712	.995
Medication regimen	.040	.596	.552	-1.279	2.390
<b>LDL</b>					
Depression	.078	1.245	.214	-.084	.374
Family Function	-.039	-.631	.529	-2.955	1.521
Age	.219	3.170	.002	.100	.428
Diabetes duration	-.058	-.834	.405	-4.474	1.813
Gender	.074	1.208	.228	-1.030	4.302
Medication regimen	.051	.778	.437	-1.037	2.391
<b>Triglycerides</b>					
Depression	-.070	-1.091	.276	-1.510	.433
Family Function	-.029	-.464	.643	-11.731	7.259
Age	.081	1.145	.253	-.291	1.101
Diabetes duration	-.041	-.578	.564	-17.249	9.422
Gender	.058	.939	.348	-5.915	16.706
Medication regimen	-.083	-1.251	.212	-11.891	2.650
<b>Cholesterol</b>					
Depression	-.031	-.484	.629	-1.094	.662
Family Function	.080	1.279	.202	-3.008	14.156
Age	.031	.436	.663	-.490	.768
Diabetes duration	-.077	-1.069	.286	-18.594	5.511
Gender	-.039	-.629	.530	-13.489	6.955
Medication regimen	-.014	-.209	.834	-7.269	5.872
<b>HbA1c</b>					
Depression	-.044	-.719	.473	-.051	.024
Family Function	.074	1.237	.217	-.137	.599
Age	-.048	-.713	.477	-.037	.017
Diabetes duration	.311	4.552	.000	.677	1.710
Gender	-.030	-.503	.615	-.550	.326
Medication regimen	.075	1.183	.238	-.112	.451

## Discussion

The aim of this study is to determine diabetes metabolic control, as measured by HbA1c, HDL, LDL, total cholesterol (TC), and triglycerides among diabetic patients in Aljouf, Saudi Arabia. In addition, the present study explored the association of diabetes metabolic control in these patients with family function, depression, and other sociodemographic and clinical data.

A recent epidemiological research study with 90,686 individuals discovered individuals with diabetes had higher rates of depression. One argument is that anxiety and sadness may be brought on by the psychological strain of having a chronic illness (17). On the other hand, family members can be viewed as facilitators and supporters when they help the patient maintain self-management. Moreover, family support has a greater impact on self-reported diabetes coping than support from professionals (18). The aim of this study was to assess the relationship between family function, depression, and metabolic control in diabetic patients.

A study in Egypt stated that the prevalence of depression was 69% (19). This is consistent with this study, revealing that the prevalence of depression among diabetic patients was 65% ranging from mild to severe depression. A previous study in Saudi Arabia stated that of the total number of diabetic patients who participated in the study, 37% had depression (20). Another study in Pakistan revealed that depression was found to be 40.0% of participants in the study (21). Also, in research by Thour et al., 41% of participants reported having depression (22). Moreover, a study conducted in Ethiopia found that the overall prevalence of depression was (37.2%) (23). In KSA, another lower prevalence rate of 45.8% was found (24).

The discrepancy regarding this prevalence may be attributed to a variety of variables, such as research design, variations in method, use of various scales, data gathering tools, the culture of the participants, and social factors, as well as characteristics of the studied population.

The family, which serves as the primary source of health information, has an impact on how people suffering from diabetes accept the demands and difficulties that diabetes enforces (25). Children and/or adolescents with type 1 diabetes and their carers, typically the parents, are the primary subjects of studies on family participation in diabetes. There are few studies on the families of adults with diabetes in the available literature. A study investigating family function in diabetic patients found that most of the respondents had family function based on good Family APGAR scores (63%) (26). The finding of this study aligns with the result of the current study that showed 70% of highly functioning families. Also, a study in Nigeria showed that (90.8%) of the study participants had healthy family functioning (27).

In Iran, diabetic women reported worse family functioning than non-diabetic ones (28). Even though it is simple to assess family functioning in diabetic patients in clinical practice, identifying potentially modifiable risk factors that are linked to dysfunctional families in diabetic patients is important during doctor-patient interactions (29). A substitute predictor of the extent to which a diabetic patient would be able to handle his or her disease and sustain long-term health and wellness states could be the absence of strong family functioning for the treatment of diabetes (27).

The present study found that the participants' mean HbA1C (8.6%) was above the recommended control level (7%) (30) which is consistent with a study by Fitzgerald et al., (31) and with studies in Pakistan and Peru (21,5). Moreover, previous studies in Saudi Arabia found that most diabetic patients did not attain the HbA1C target (32,33). A large percentage of persons with T2DM in Saudi Arabia remain to have insufficient glycemic control despite access to excellent medical care and a variety of free anti-diabetic drugs (32). Living an inactive lifestyle and consuming processed, high-fat foods have made it more challenging for diabetics to regulate their blood sugar levels. A recent study showed that the mean body mass index among the Saudi Arabian population was 33.9% (34). Undoubtedly, individuals suffering from diabetes have greater rates of overweight and obesity than the nation's overall population. This leads to more uncontrolled glycemic control among diabetics. This suggests that a portion of the individuals in this sample may be at higher risk for problems due to diabetes.

Consistent with other studies, the linear regression model demonstrated the predictors of metabolic control among diabetic patients, and diabetes duration was associated with higher HbA1c levels in the study participants (31, 35). A short life expectancy, cognitive decline, functional dependency, and medication resistance may be contributing factors leading to this poor control (35). Saudi Arabia is one of the top MENA nations in terms of the prevalence of metabolic syndrome. Additionally, compared to other ethnic groups, Saudis have a higher prevalence of metabolic syndrome (36). The current study also discovered an alarmingly high frequency of dyslipidemia in the study's population of adult T2DM patients residing in Aljouf, Saudi Arabia. These findings are consistent with those made by earlier studies conducted in Middle Eastern settings, such as Saudi Arabia, which revealed the disorder's high incidence (37,38).

According to the study's findings, the mean HDL level was 2.64 mmol/L, which is in line with the recommended target. This is consistent with Fitzgerald et al findings (31). In the present study, more than half of the participants reached the recommended goal for HDL level. Also, more than half of the participants reached the recommended goal for HDL level while it was about 20% among the participants of the Yousefzadeh et al., study (39). This difference may be due to differences in sampling population ethnicity, lifestyle,

and medical services. The present study also found that triglyceride was the most common lipid with abnormality, as 68.5% of the sample had high levels of triglycerides. This was congruent with a study conducted in Saudi Arabia (40). On the other hand, Alzaheb and Altemani concluded that hypercholesterolemia was the most common lipid abnormality in their study sample (37).

However, in the current study, the mean cholesterol level, nor triglyceride reached the recommended target for type 2 diabetic patients. To be able to fulfill the goal level for triglycerides, a higher percentage of these patients should have their lipid profiles closely monitored. Strict control of lipids is crucial in lowering the risk of cardiovascular incidents (31). This study demonstrated a high prevalence of dyslipidemia as well as possible risk factors contributing to the illness. According to the current study, increasing age was associated with higher LDL levels. This association is consistent with earlier studies that discovered a link involving a patient's age and higher blood lipid levels (37, 38). Older age has always been recognized as the most harmful cause of dyslipidemia. According to both cross-sectional and longitudinal investigations, age was positively correlated with TC, LDL, and TG values (41). Gradual weight gain and insulin resistance that accompanies increasing age may be contributing factors to this association.

Regarding depression and family function as predictors of glycemic control, the study found no association between these predictors and glycemic control. These findings were consistent with a previous study indicating that family function does not influence the degree of glycemic control in people with type 2 diabetes (12). Another study suggests that sustaining lifestyle modifications and diabetes self-management depend heavily on relationships between the patient and their family (13). Members of the family can therefore be thought of as enablers and supporters when they help the patient's self-management (18).

Some studies were consistent with this study and did not find a significant association between poor glycemic control and depression (42,43). Although, according to several research, distressed T2DM patients have greater HbA1c values than people who are not depressed (44,45).

#### Limitations of the study

The study was cross-sectional in nature, so no causal relationships could be drawn. A rising body of research suggests that a combination of several genes carrying risk alleles is responsible for the community's variation in lipid levels. The scoring tool PHQ-9 could over or underestimate the prevalence of depression or the bidirectional relationship between depression and metabolic parameters. The findings cannot be generalized to the total population of Saudi Arabia as the study was conducted in only one province. Also, we cannot ignore the possibility of bias in self-reported studies.

## Conclusions

This study suggests that family function and depression do not directly affect diabetic patients' metabolic control and the study showed a high prevalence of uncontrolled HbA1c levels and dyslipidemia among the study participants. Increasing age was associated with higher LDL levels and diabetes duration was associated with higher HbA1c levels in patients with diabetes. It is necessary to conduct more research on the short- and long-term effects of family function and depression in various disease control contexts and at various disease management levels. Further investigation into the variables underlying the control of diabetes is required to further enhance patient outcomes because many people are still failing to meet metabolic control objectives.

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**Institutional Review Board Statement:** "The study was conducted following the Declaration of Helsinki. The study was approved by the local committee of Bioethics at Jouf University, Saudi Arabia (reference number 11-07/41). Another approval was taken from the local committee of research ethics in the Northern Border region registered with the National Bioethics Committee No. (H-09-A-51) (reference number 691498).

**Informed Consent Statement:** "Informed consent was obtained from all subjects involved in the study."

**Data Availability Statement:** The data used to analyze the present study findings will be provided by the corresponding author upon request.

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**Conflicts of Interest:** "The authors declare no conflict of interest."

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# Assessment of Vaccination Rates and Barriers in Family Medicine Practices: A Cross-sectional Study

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## Abstract

**Background:** Vaccination is a crucial tool in public health for preventing the spread of infectious diseases. Understanding the factors influencing vaccine acceptance and addressing barriers to vaccination are essential in promoting vaccine uptake and achieving population-level protection.

**Methodology:** This study examined the demographic factors, vaccination rates, and barriers to vaccination among 385 participants. The participants were categorized based on age, gender, marital status, having children, monthly income, educational level, occupation, and nationality. Data on willingness to vaccinate, completion of the vaccination course, and barriers to vaccination were collected through surveys.

**Results:** The study found that 80% of participants expressed their willingness to take the COVID-19 vaccine. Factors included age, having children, monthly income, and educational level, influenced vaccine acceptance. Participants in the 18-25 years age group showed the highest willingness to vaccinate (85%), while those with higher incomes and higher educational levels also demonstrated higher rates of acceptance. Several barriers to vaccination were identified, including fear of vaccination, concerns about vaccine safety, and accessibility issues.

**Conclusion:** This study highlights the importance of vaccination and provides valuable insights into the demographic factors, vaccination rates, and barriers to vaccination. The findings emphasize the need for targeted interventions to address specific concerns and improve accessibility to vaccines. By addressing these barriers, public health authorities can enhance vaccine acceptance and achieve widespread vaccination coverage, thereby mitigating the impact of infectious diseases on public health.

### Key words:

Vaccination rates, Barriers,

## Introduction

Vaccinations have long been seen as a pillar of public health, playing a crucial role in preventing and controlling infectious diseases [1,2]. They have had a significant role in decreasing global morbidity and mortality, protecting individuals and communities from a variety of vaccine-preventable diseases [3]. Family medical practices are essential healthcare venues for administering vaccinations, ensuring that people of all ages receive the necessary immunizations to safeguard their health and well-being. Nevertheless, despite the demonstrated advantages of immunizations, inadequate vaccination rates and enduring hurdles continue to be obstacles to reaching optimal immunization coverage [4,5].

Throughout history, vaccine-preventable diseases have been a substantial cause of morbidity and mortality [6]. Vaccinations have been crucial in reducing the global burden of many diseases, sparing millions of illnesses, hospitalizations, and deaths [1–3]. Nevertheless, despite the availability of safe and effective vaccines, immunization rates vary across groups and areas. Inadequate vaccination rates continue to make communities susceptible to outbreaks and impede the possibility of disease eradication.

Family medicine practices serve a crucial role in the delivery of comprehensive healthcare to people and families, including routine vaccines. These offices provide primary care, providing continuity of service and emphasizing preventative medicine. By administering immunizations on-site, family care clinics are well-equipped to meet the immunization requirements of varied patient populations, including children, adolescents, and adults. However, the success of vaccination programs depends on a number of factors, including the knowledge, attitudes, and practices of healthcare practitioners, as well as the existence of obstacles that limit vaccination delivery [7,8].

Understanding the barriers to vaccination within family medicine practices is essential for the development of focused strategies to increase immunization rates. Factors such as vaccine hesitation among patients or healthcare providers, logistical issues in vaccine administration, lack of awareness or understanding regarding immunization schedules and protocols, and inadequate resources or support systems for vaccine delivery are examples of potential barriers [9]. Identifying and resolving these obstacles is crucial for implementing measures that can boost immunization rates, protect vulnerable groups, and improve public health outcomes.

In order to shed light on the factors that contribute to under-vaccination and impede the efficacy of immunization programs, the purpose of this study was to examine vaccination rates and identify barriers within patients who visited family care practices. By gaining knowledge of these characteristics, healthcare practitioners and policymakers can devise tailored interventions to increase vaccination rates and resolve identified impediments, thereby improving public health outcomes.

## Methodology

### Study Design:

A cross-sectional study design was employed to assess vaccination rates and barriers in family medicine practices. This design allowed for the collection of data at a specific point in time and enabled researchers to examine the relationship between variables.

### Sample and Setting:

The study was conducted in multiple family medicine practices across diverse geographic regions. A convenience sampling method was utilized to select practices that were willing to participate in the study. The sample size was determined based on the availability and willingness of participating practices. Inclusion criteria including all patients of both gender, who were older than 18 years old, and who agreed to participate in the questionnaire.

### Data Collection:

Data were collected using a questionnaire administered to patients who attended family medicine facilities including PHCs. The questionnaire covered various aspects related to vaccination, including perceptions, knowledge, practices, and barriers. The questionnaire included demographic factors such as age, gender, marital status, having children, number of children, monthly income, educational level, occupation, and nationality. These demographic factors allowed for a comprehensive understanding of the participants' characteristics and their potential influence on vaccination rates and barriers. The questionnaire assessed vaccination rates by asking participants about their willingness to take vaccination and whether they had completed their vaccination against COVID-19. For participants with children, the questionnaire also asked if their child had completed the vaccination course. To identify barriers to vaccination, participants were presented with a list of choices and asked to select the main barriers that prevented them from being vaccinated or vaccinating their children. The choices included options such as fear of vaccination, unavailability of vaccines, perceived lack of importance of vaccination, concerns about vaccine safety, belief that vaccination could lead to other diseases, belief that vaccination could lead to the disease itself, cost-related barriers, distance to vaccination facilities, influence of doctors, friends, or family members, and an option for no barriers.

### Ethical Considerations:

The study adhered to ethical guidelines for research involving human subjects. Informed consent was obtained from all participating family medicine practices and healthcare providers. Confidentiality and anonymity of the collected data were ensured, and data were securely stored and accessible only to authorized researchers.

### Data Analysis:

MS Excel was used for data entry, cleaning, and coding while SPSS version 26 was used for data analysis. Descriptive statistics were used to summarize the demographic characteristics of the participants. Vaccination rates were

calculated as proportions with corresponding confidence intervals. Bivariate analyses, such as chi-square tests or t-tests, were conducted to explore associations between vaccination rates and demographic factors. Barriers to vaccination were analyzed by calculating the frequencies and percentages of the selected barriers. The most commonly reported barriers were identified based on the responses provided by the participants.

## Results

In the current study, we were able to collect the data from 385 participants. The majority of the participants fell in the 26-35 years age group (45%), followed by 18-25 years (30%), 36-45 years (15%), and 46 years and above (10%). The gender distribution was skewed towards males, accounting for 60% of the participants. The majority of participants were married (60%) and had children (53.7%). Among those with children, the distribution of participants based on the number of children was relatively balanced, with 1 child (39.7%), 2 children (29.9%), and 3 or more children (30.4%). In terms of monthly income, 40% of participants had a low income, 45% had a medium income, and 15% had a high income. Educational levels were distributed as follows: high school or below (25%), bachelor's degree (50%), and master's degree or higher (25%). The majority of participants were employed (70%), and 80% were Saudi nationals (Table 1).

Turning to the vaccination rates, the study examined the participants' willingness to take the COVID-19 vaccine and their completion of the vaccination course. The findings revealed that 80% of participants expressed their willingness to take the vaccine, while 20% reported being unwilling. In terms of vaccination completion, 75.1% of participants had completed their COVID-19 vaccination, while 24.9% had not yet completed it. Moreover, the study investigated the completion of the child's vaccination course, and it was found that 97.1% of participants reported that their child's vaccination course was completed (Table 2).

Exploring the relationship between demographic factors and willingness to vaccinate, several interesting patterns emerged. Participants in the 18-25 years age group showed the highest willingness to vaccinate (85%), followed by the other age groups. Gender did not significantly influence the willingness to vaccinate. Participants with children demonstrated a higher willingness to vaccinate (85%) compared to those without children (70%). Monthly income had a significant impact, with participants with a high income (84%) showing a higher willingness to vaccinate. Educational level also played a role, as individuals with a master's degree or higher (85%) exhibited a higher willingness to vaccinate compared to those with a high school education or below (70%) (Table 3).

The study also identified various barriers against vaccination. The most commonly reported barriers included fear of vaccination (35%), concerns about vaccine safety (25%), and the belief that vaccination could lead to other diseases (15%). Participants also mentioned barriers such as unavailability of vaccines (20%), perceived lack of importance of vaccination (10%), cost-related factors (10%), distance to vaccination facilities (15%), and the influence of doctors, friends, or family members (5%). It is worth noting that 20% of participants reported having no barriers to vaccination (Figure 1).

**Table 1: Demographic Factors of the participants (N=385)**

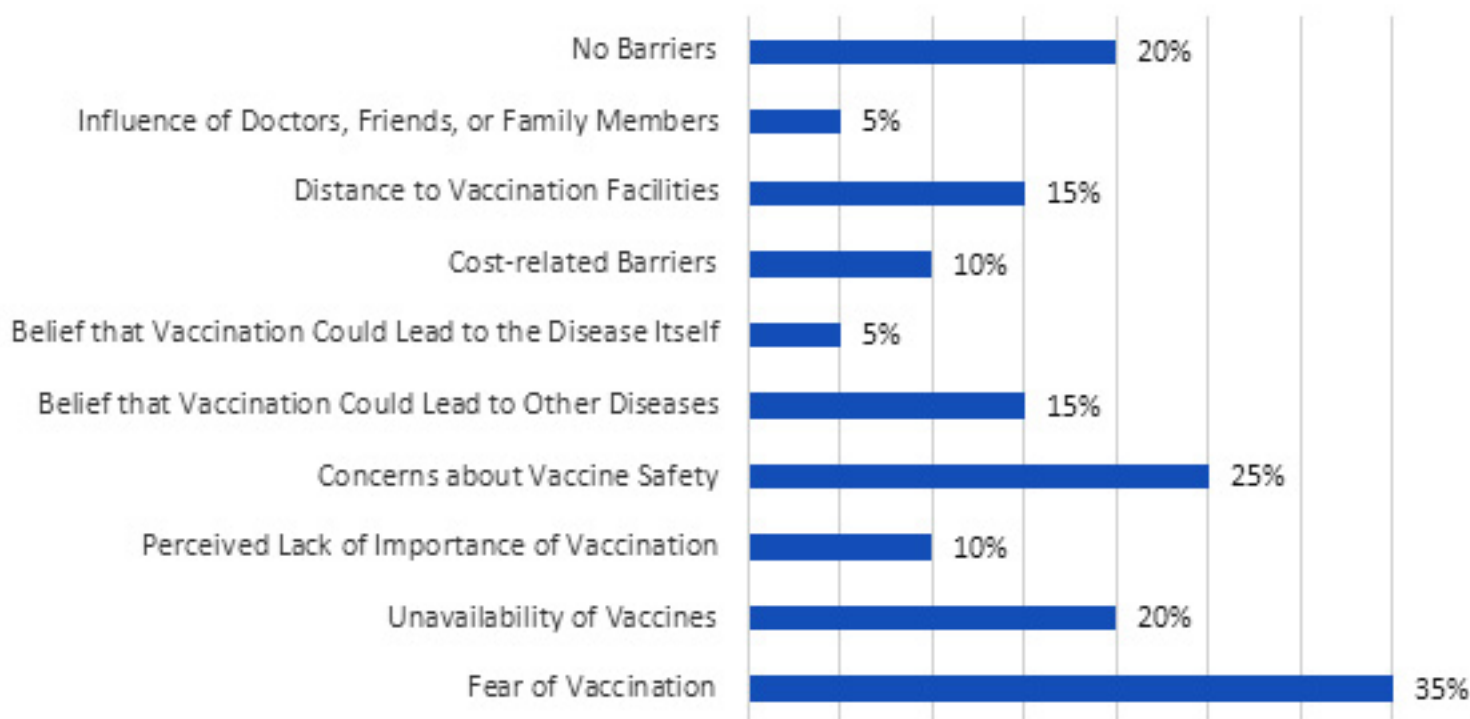
	Demographic Factor	Frequency	Percent
<b>Age</b>	18-25 years	115	30%
	26-35 years	173	45%
	36-45 years	58	15%
	46 years and above	39	10%
<b>Gender</b>	Male	231	60%
	Female	154	40%
<b>Marital Status</b>	Single	135	35%
	Married	231	60%
	Divorced	19	5%
<b>Having Children</b>	Yes	207	53.7%
	No	178	46.3%
<b>Number of Children</b>	1 child	82	39.7%
	2 children	62	29.9%
	3 or more children	63	30.4%
<b>Monthly Income</b>	Low	154	40%
	Medium	173	45%
	High	58	15%
<b>Educational Level</b>	High school or below	96	25%
	Bachelor's degree	192	50%
	Master's degree or higher	96	25%
<b>Occupation</b>	Employed	269	70%
	Unemployed	116	30%
<b>Nationality</b>	Saudi	308	80%
	Non-Saudi	77	20%

**Table 2: Vaccination Rates among the participants**

Vaccination Rate	Frequency	Percentage
<b>Willingness to Take Vaccination</b>		
- Yes	308	80%
- No	77	20%
<b>Completion of COVID-19 Vaccination</b>		
- Completed	289	75.1%
- Not Completed	96	24.9%
<b>Completion of Child's Vaccination Course</b>		
- Completed	374	97.1%
- Not Completed	11	2.9%

<b>Table 3: Relationship between Demographic Factors and Willingness to Vaccinate</b>					
<b>Demographic Factor</b>	<b>Willing to Vaccinate (%)</b>				<b>P-value</b>
	<b>Yes</b>		<b>No</b>		
	<b>Count</b>	<b>Percent</b>	<b>Count</b>	<b>Percent</b>	
<b>Age</b>					
- 18-25 years	98	85%	17	15%	0.030*
- 26-35 years	138	80%	35	20%	
- 36-45 years	44	76%	14	25%	
- 46 years and above	27	69%	12	30%	
<b>Gender</b>					
- Male	185	80%	46	20%	0.268
- Female	116	75%	38	25%	
<b>Marital Status</b>					
- Single	95	70%	40	30%	0.365
- Married	185	80%	46	20%	
- Divorced	14	74%	5	25%	
<b>Having Children</b>					
- Yes	176	85%	31	15%	0.000*
- No	125	70%	53	30%	
<b>Number of Children</b>					
- 1 child	66	80%	16	20%	0.140
- 2 children	47	76%	15	25%	
- 3 or more children	44	70%	19	30%	
<b>Monthly Income</b>					
- Low	116	75%	38	25%	0.015*
- Medium	138	80%	35	20%	
- High	49	84%	9	25%	
<b>Educational Level</b>					
- High school or below	67	70%	29	30%	0.018*
- Bachelor's degree	154	80%	38	20%	
- Master's degree or higher	82	85%	14	15%	
<b>Occupation</b>					
- Employed	215	80%	54	20%	0.281
- Unemployed	87	75%	29	25%	
<b>Nationality</b>					
- Saudi	246	80%	62	20%	0.382
- Non-Saudi	58	75%	19	25%	

## Figure 1: Barriers Against Vaccination



### Discussion

Vaccination is an indispensable technique for controlling the spread of infectious illnesses and protecting public health [10]. History's triumphs in eradicating or controlling illnesses like smallpox, polio, and measles have demonstrated the significance of immunization [11]. As a result of the outbreak of the COVID-19 pandemic, the production and distribution of vaccines have become crucial for reducing the virus's effects [12]. Understanding the factors that influence an individual's willingness to vaccinate and removing impediments to vaccination are crucial for increasing immunization rates and obtaining population-level protection.

The results of the study provided insight on the vaccination rates of the participants and the factors that affect these rates. Completing the course of COVID-19 was chosen in the current study as it is the last vaccination provided to the public, therefore, completing this course could be an indication of general willingness to receive vaccination. Eighty percent of individuals indicated a willingness to get the COVID-19 vaccine, indicating a rather high level of vaccination preparedness. This result is within the rates reported in some previous studies which reported rates of willing to receive COVID-19 vaccination ranged between 57.8% - 82.4% [13–17]. This is a promising conclusion since it indicates a favorable attitude toward vaccination and an understanding of its significance in combatting the pandemic. Age was identified as a significant factor influencing vaccination acceptance. Participants between the ages of 18 and 25 had the greatest vaccination rate of 85 percent. This result is consistent with earlier findings that younger persons tend to

be more receptive to vaccination [18,19], potentially as a result of their higher exposure to vaccination efforts, greater access to information, and stronger feelings of social duty [19]. In the present investigation, a significant connection between gender and vaccine acceptance was not found however; willingness to accept the vaccination was slightly higher among men. This result is consistent with earlier studies that have indicated no significant gender differences in vaccine acceptability with slightly higher hesitancy among women [20,21]. Noting that gender-specific issues, such as cultural beliefs or concerns, may still play a role in particular groups and should be taken into account when designing personalized vaccination tactics is essential. Having children was found to have a favorable effect on vaccination willingness, with 85 percent of those who had children indicating their willingness to be vaccinated. This result emphasizes the importance of parental responsibility and the need to safeguard oneself and one's children against the virus. Campaigns promoting public health should emphasize the significance of vaccination for parents and promote the concept of "vaccinating to protect the entire family."

The willingness to vaccinate was additionally affected by monthly income. Those with a high monthly income were more likely to be vaccinated (84 percent) than those with a low (75 percent) or medium (80 percent) income. Most likely, financial security and access to healthcare services contribute to this gap. Individuals with lower incomes may face financial obstacles, such as the expense of transportation to vaccination sites or the potential loss of income owing to time off work for immunization [4,22]. By addressing these cost hurdles through subsidized or free vaccination programs and by guaranteeing easy access to vaccination sites, this gap can be bridged.

Individuals with a master's degree or higher demonstrated a higher rate of vaccination willingness (85 percent) than those with a high school diploma or less (70 percent). Higher levels of education are frequently related with improved health literacy, information availability, and critical thinking abilities [23,24]. These variables may help in a better comprehension of the advantages of vaccination and an increased possibility of acceptance. Individuals with a lower level of education should be the focus of educational efforts designed to address their specific issues and informational requirements.

The study highlighted a number of barriers to vaccination that must be addressed in order to increase vaccine adoption. Fear of immunization was the most often cited impediment, cited by 35% of responders. This apprehension may be due to a number of factors, including worries about potential adverse effects and widespread disinformation in the community [25]. Addressing vaccine hesitancy through clear and open communication, the provision of evidence-based information, and the rebuttal of myths and misconceptions can help lessen this concern and develop confidence in the immunization procedure. Twenty-five percent of interviewees expressed concerns regarding vaccine safety which was also reported by previous studies [26,27]. The quick development and emergency use authorization of COVID-19 vaccines may give rise to these issues, leading to the perception of insufficient testing or unknown long-term effects [28]. To address these concerns, public health officials should emphasize the stringent safety measures used during vaccine development, the comprehensive testing undertaken throughout clinical trials, and the continued monitoring of vaccine safety following approval. Open communication with healthcare experts can also aid patients in making informed decisions and addressing any particular issues. Accessibility constraints, such as the unavailability of vaccinations (20%) and the distance to immunization centers, were also highlighted (15 %). These obstacles can be solved by ensuring a sufficient supply of vaccines and establishing vaccination facilities in conveniently accessible places [12,29].

Participants also cited perceived lack of importance of vaccination (10%) and cost-related factors (10%) as additional impediments. These obstacles may result from a lack of knowledge regarding the seriousness of COVID-19 or the potential repercussions of refusing vaccination [30,31]. Effective communication efforts should highlight the significance of vaccination in preventing severe illness, hospitalization, and mortality, as well as vaccination's function in achieving herd immunity and protecting vulnerable groups. In addition, providing free or subsidized vaccination services can assist in reducing cost-related barriers and ensuring equal access to vaccines.

Overall, this study provides insightful information regarding vaccination rates especially considering COVID-19 vaccination, variables influencing them, and difficulties faced by individuals. The participants' high willingness to be vaccinated is positive, but it is essential to address the

identified causes and barriers to ensure vaccine uptake is equitable across all demographic categories. Customized measures, such as educational campaigns, targeted outreach, and enhanced accessibility, can increase vaccine adoption and contribute to pandemic control.

It is crucial to emphasize that there were limitations to this study. The sample size was restricted to 385 individuals, which may not adequately represent the population's diversity. The study also relied on self-reported data, which may be susceptible to recall bias or social desirability bias. Future research should aim for larger and more diverse samples, longitudinal designs to measure changes in vaccine attitudes over time, and mixed-method approaches to acquire a thorough knowledge of the factors that influence vaccination rates.

In conclusion, immunization serves a critical role in protecting public health, and knowing the factors that influence vaccine uptake is crucial for the effectiveness of vaccination campaigns. This study examines COVID-19 immunization rates, demographic characteristics, and challenges encountered by persons. By addressing barriers such as fear, safety concerns, and accessibility challenges, public health officials can increase vaccine uptake and achieve their aim of widespread immunization coverage. Continued efforts in education, communication, and accessibility will be crucial for controlling the present pandemic and preventing future outbreaks.

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# Mental Health program integration into Primary Health Care: Results of a Project Implemented at Yarmouk Health Care Center & Capital Health Primary Care Center, Kuwait

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## Abstract

**Objective:** World Health Organization (WHO) identified a gap in meeting mental health care needs in the health services. To bridge this gap, at Yarmouk Primary Health Care Center and Capital Health District area in Kuwait, it was decided to implement a best practice model, for integrating mental health services into primary health care services in Kuwait.

**Methodology:** Implementation of the best practice model, for integrating mental health services into primary care services in Kuwait's health system was initiated in 2008.

It involved the integration of cost-effective, feasible evidence-based interventions for mental health conditions in Primary Health Care (PHC) and other priority health programs. It envisioned a mental health component in PHC, to enhance access to mental health care and improve identification and treatment rates for priority mental disorders, to provide holistic care for particularly disabling comorbid physical and mental health problems, and to engage in mental health promotion.

**Results:** The program was initiated in 12 primary mental health care clinics in the Capital Health District area in Kuwait. Two hundred (200) Family Physicians and General Practitioners, were trained in psychiatric integration within the primary health care system. Regular evaluation of the performance of physicians working in primary mental health clinics in the program was ensured. Periodic evaluation of psychiatric patient visits in the Primary mental health clinics was conducted for quality improvement. Mental health awareness days and educational sessions were organized.

**Discussion:** A practice model for integrating mental health services into primary care was developed in Kuwait, involving stakeholders. Its favorable impact on mental health in the community is undergoing scrutiny. Limitations such as human resource shortage and, movement of trained physicians from primary care to other administrative departments in the Ministry of Health (MOH), coupled with a lack of relevant data and the need for better coordination between stakeholders, were identified. Issues regarding electronic health records, patient confidentiality, and quality of services were identified. Stigma related to mental health issues resulted in a delay in implementing the integration.

**Conclusion:** With increasing psychiatric illnesses and a lack of adequate specialized mental health services, addressing this issue at the primary care level offers an attractive cost-effective option to deal with the crisis.

**Keywords:** Mental Health, Primary Health Care, Integration, Health system, Family Physician

## Introduction

Health systems have failed to address the rising mental health related disease burden (1). Unfortunately, mental health diseases including depression, generalized anxiety disorder, panic disorder, obsessive-compulsive disorder, post-traumatic stress disorder, and social anxiety disorder may affect up to 15% of the population (2). Regrettably, individuals with psychiatric illnesses avoid seeking treatment due to associated stigma and often seek help from sources not trained in mental health (3).

The estimated prevalence rates in large international studies for depression, anxiety, and somatoform disorders are 31–35.8%, 19–25.6% and 18–28.8% respectively. Evidence suggests these disorders to be the commonest mental disorders presenting in primary care settings (4,5).

The rise in mental health disorders in Kuwait was identified as early as 2014 (6). In a study looking at patients visiting primary care centers in Kuwait, 42.7% of the patients suffered from psychiatric disorders including depressive (22.9%), anxiety (17.7%), and somatization (33.4%) disorder (7). During the COVID-19 pandemic, 53.7% and 59.6% of the respondents experienced anxiety and depression respectively in Kuwait (8). Need to address mental health as an essential part of health is considered mandatory (9).

In Kuwait, the number of trained psychiatrists is less than 84 in a country of nearly 4.5 million (2). Availability of specialized mental health facilities is limited and expensive to develop and operationalize. Incorporation of mental health services in existing primary health services offers a cost-effective option to deal with high mental health disease burden in the community, integrates physical and mental health care in a holistic manner and offers better overall health-related outcomes.

The treatment gap for mental disorders is enormous due to inadequate specialized mental health services. Primary care is supported by the Ministry of Health, Kuwait, and offers healthcare free of cost, including medications. This ensures the availability of mental health services to those in need and closes the treatment gap, caused by scarce specialized mental health services. Primary care for mental health generates good health outcomes and reduces the stigma associated with psychiatric disease.

Primary care for mental health in Kuwait enhances access with primary care services being widely available, thereby guaranteeing cover for all patients. Primary care for mental health promotes respect for human rights. Medico-legal ethics policies are implemented and continuously supervised by the Ministry of Health, Kuwait.

Based on the identified need, stakeholders at Yarmouk Primary Health Care Center and Capital Health District Kuwait, decided to implement a best practice model, for integrating mental health services into primary care services in Kuwait.

## Setting up Integration

Yarmouk Primary Health Care Center and Capital Health District in Kuwait, started integration of mental health programs into their health delivery system in 2008. Table 1 lists the strategic steps undertaken for the integration of mental health services into primary health care services. An integration model, based on successful international practices was developed. Primary care physicians working at primary care sites were trained in dealing with common mental health disorders. The training program started in 2012, in partnership with psychiatry services.

An advanced primary mental health program was organized by the capital primary mental committee. The program included diagnosing and management of common psychiatric disorders, psychopharmacology, psychotherapy, pediatric and geriatric psychiatric disorders. Family Physicians already provide broad-based, comprehensive, and holistic care, encompassing a bio-psycho-socio-spiritual model of health care.

Health awareness activities were held to increase awareness about mental health issues in the community and help reduce the stigma associated with mental illness. Two major mental health campaigns were carried out between 2011 and 2020. "Taqabal", which means accept your mental illness, was conducted for middle and high school students. It involved storytelling and short educating movie presentations. "Ghad", was the second one on suicide prevention and explained suicide red flags symptoms, and first aid for suicide prevention.

Mental health awareness days and educational sessions were organized for the general population visiting primary care centers. Special sessions were held on World Mental Health Day. A local and international cooperation network with stakeholders was developed.

Regular evaluation of the performance of physicians working in primary mental health clinics in the program was ensured. Family Physicians were evaluated after attending theoretical and clinical training. Regular evaluation of psychiatric patient visits in the primary mental health clinics and general clinics in all centers was conducted for quality improvement.

Two additional primary care centers were equipped with mental health services annually. The number of patients visiting mental health clinics in all health centers was compiled annually. Follow-up on the performance of psychiatric clinics in all health centers, using the standards approved by the Mental Health Committee, was being implemented. Availability of online mental consultation was ensured.

Training two Family Physicians from each health center was started, to work on international mental health protocols and obtain a mental health diploma. The regular performance of Family Doctors in mental health clinics was monitored through a standardized evaluation process. Annual assessment of the satisfaction of the auditors, doctors working in the clinic, and heads of centers that provide mental health services was put in place and implemented.

Retaining doctors who dropped out after training in primary mental health programs remained a challenge. Although the program trained 20-30 physicians each year between 2011 and 2019, many left to carry out other administrative work or clinical duties.

The clinic space was made safe and comfortable for patients and privacy was ensured. Diagnostic and screening tools for mental illnesses were made available. Provision was made at the center for psychotherapy services and conduct of psychoeducation. A variety of drugs is also available free of charge for all patients.

Integration is most successful when mental health is incorporated into health policy, and legislative frameworks, supported by senior leadership, adequate resources, and ongoing governance. To be fully effective and efficient, a committee for mental health, coordinated with a network of services at different levels of care.

Most of the psychiatry services in the capital area and a few in other areas were established during 2011-2021. Family physicians in charge of these clinics were well-trained. Each health center had a local procedure of referral to the psychiatry clinic in the health center. Most of the well-established clinics had well-organized patient lists. Most of the psychiatric clinics were well equipped with WHO guidelines and diagnostic and screening tools for common psychiatric problems and drugs.

**Table 1: Studies included in the review**

- 1. Policy makers, four Family Physicians in Yarmouk Health Center and other centers and Psychiatrist developed models for clinical care, to address gaps in the access to quality mental health treatment in primary care.**
- 2. Development of an optimized integration model, based on available international successful practices in the introduction of mental health clinics in PHC centers.**
- 3. Family Physicians were trained, and capacity built to ensure the best level of diagnosis and treatment in coordination with the psychiatric services.**
- 4. Clinics were well equipped with guideline and diagnostic and screening tools for common psychiatric problems.**
- 5. Health awareness drives were held to increase awareness about mental health issues among community and help reduce stigma associated with mental illness.**
- 6. Key performance Indicators monitoring including the performance of physicians working in primary mental health clinics.**
- 7. Regular evaluation of psychiatric patient visits in the primary mental health clinics and general clinics in all centers.**
- 8. Follow up on the performance of psychiatric clinics in all health centers, using the standards approved by the Mental Health Committee.**
- 9. The clinic space was made safe and comfortable for patients and privacy was ensured.**
- 10. Diagnostic and screening tools for mental illnesses were made available.**
- 11. Provision was made at the center for psychotherapy services and conduct of health awareness sessions.**
- 12. A local and international cooperation network with stakeholders concerned with mental health was developed.**
- 13. To ensure success of Integration, mental health was incorporated into health policy, legislative frameworks, supported by senior leadership, adequate resources, and ongoing governance.**
- 14. A Committee for mental health, coordinated with a network of services at different levels of care, to be more broadly supported within the health system development.**

Table 2: Integration of Mental Health into Primary Health Care: Challenges and way forward

Serial Number	Challenge	Way forward
1.	A shortage of well-trained Family Physicians in Mental Health	Scale up training of Family Physicians in Mental Health related diseases; offer incentives for retention
2.	Specialized Family Physicians were found busy with other commitments.	Protected time to be provided to Family Physicians for Mental Health related tasks
3.	Shortage of medicines including benzodiazepines	Procure additional medicines to address shortage
4.	Lack of clear policies related to Mental Health integration into Primary Health Care	Develop and implement policies related to Mental Health integration into Primary Health Care
5.	Lack of communication between stakeholders related to Mental Health integration into Primary Health Care	Take steps to improve communication between stakeholders related to Mental Health integration into Primary Health Care
6.	Lack of availability of statistics from the Ministry of Health, related to Mental Health integration into Primary Health Care. Need for better documentation by medical staff	Ensure availability of statistics from the Ministry of Health, related to Mental Health integration into Primary Health Care
7.	Lack of support from officials and decision makers in the Ministry of Health, about mental health policies and intervention	Solicit support from officials and decision makers in the Ministry of Health, about mental health policies and intervention
8.	Need to strengthen ethical policies and laws for the regulation and standardization of mental health services in primary care and the rights of individuals.	Strengthen ethical policies and laws for the regulation and standardization of mental health services and the rights of individuals
9.	Need to reform and develop the electronic files on mental health	Reform and develop the electronic files on mental health
10.	Need for government participation and facilitation to run a screening program for different psychiatric problems among employees in the public sector	Tasked steps to ensure government participation and facilitation to run a screening program for different psychiatric problems among employees in the public sector

## Discussion

Mental illness affects the population in Kuwait, and it can only be addressed if coordinated action is taken by all stakeholders. Primary care services in Kuwait attempted to upgrade the knowledge and skills of primary care physicians in mental health and illness.

Table No: (2) lists challenges and ways forward for the integration of mental health-related services into primary health care. Several challenges were encountered during program implementation. A shortage of well-trained Family Physicians was witnessed in the program for screening and management of mental health disorders, which may affect the quality of care and safety of the patients. The specialized family practitioners were found to be busy with other commitments, even though there is evidence that integrating mental health in primary care does not cause burnout (10). Shortage of drugs including benzodiazepine, and other common simple antipsychotic drugs was encountered.

There is a suicide referral policy, but it is not followed by all stakeholders, resulting in compromised care. Electronic file in the psychiatry clinic is connected to other clinics, so patient confidentiality is an issue. There are insufficient numbers of clinical psychologists to facilitate work in primary clinics.

A lack of clear policies and communication between stakeholders exists and needs to be addressed. Ensuring the continued supply of well-trained human resources is a challenge and needs to be addressed. Threats exist in the continuation of the clinic in cases of replacing/changing or retiring the well-trained family doctor or the general practitioners.

Obtaining statistics from the concerned primary care department in the Ministry of Health creates challenges in monitoring and evaluation of the program. Further support is required from the mental health committee and heads of primary care centers on program policy and implementation.

Challenges exist about generating support from officials and decision-makers in the Ministry of Health, about mental health policies and interventions. There is a need to strengthen ethical policies and laws for the regulation and standardization of mental health services and the rights of individuals who seek and are undergoing treatment. A need was identified to engage with the IT Department in the Ministry of Health, to reform and develop the electronic files on mental health and has been implemented. Continuous support is needed from the central department for primary care to update the medical electronic file in Primary care.

Opportunity exists to increase the number of Family Physicians who are interested in psychiatry and to train them in dealing with mental health and illness. Opportunity exists for government participation and facilitation to run a screening program for different psychiatric problems

among employees in the public sector. Better liaison with hospital services will result in great benefits for patients.

Continuation of the program involves re-organizing the primary mental health team and ensuring rigorous follow-up and assessment of the mental health education and training programs. Additional training of Family Physicians at the Psychiatry training site is required. Creating a new policy regarding suicide prevention together with a public awareness campaign is required.

Research conducted elsewhere supports the idea of integration of mental health with primary care. It is considered a complex process that depends on a variety of strategies occurring at multiple levels of the healthcare system. It is an option that holds much potential to significantly impact the mental health and well-being of populations (11).

## Conclusion

Integrating Mental Health services within primary health care delivery setup is the need of the hour. With increasing psychiatric morbidity and a lack of adequate specialized mental health services, addressing this issue at the primary care level offers an attractive cost-effective option to deal with the crisis.

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# The Effect of screen time on Children's Behaviour

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## Abstract

As more of their leisure time is spent with screens such as iPhones, tablets, computer games, and television, parents, health experts, and educators are concerned about the impact of screen time on children's well-being. Excessive screen usage has a negative impact on the verbal, emotional, and physical growth of children. Because children and teenagers are naturally drawn to screens, the aim is to teach them how to use them responsibly. Screens may help promote self-esteem and give numerous chances for learning and growth when used with good screen objectives and abilities. Children, especially those above the age of three, respond to interactive programming that is entertaining, suited to them, and stimulates imitation or participation. Dynamic video games may encourage light-to-moderate or acceptable physical exercise in the near future. Families and child care providers may include more physical activity into daily routines by using fun, age-appropriate exercise (e.g., yoga or dance) and fitness apps or videogames. As a result of these concerns, parents are being advised to limit their children's screen time on a daily basis, with particular time constraints for children and a general guideline to minimize screen time in teenagers.

**Key words:** screen time, children's behaviour



## Introduction

In the last half century, the use of digital media has skyrocketed. It has resulted in an increase in human exposure to long durations of screen time, which is becoming a growing concern. Use of electrical devices to store, generate, or analyse data, as well as the enhancement of interaction and online engagements on social networking sites via the internet, is characterised as digital technology (Vizcaino et al., 2020). Humans require social interaction to survive. Furthermore, social interaction improves mental health. Children who spend so much time next to the television or computer may lose their ability to perceive other people's emotions (Duch et al. 2013). As a result, a youngster may have lower self-esteem, sour relationships, and low self-esteem. Furthermore, research has connected higher levels of early childhood screen exposure to emotional and family issues. Spending too much time on social media before bed can interrupt sleep and cause problems at school, including symptoms that are comparable to attention deficit hyperactivity disorder (ADHD) (Radesky & Christakis, 2016).

Electronic gadget use is a common sedentary behaviour in Western society, especially among young people. Children in Canada and the U.S. spend a total of 7 to 8 hours per day engaging in inactive screen-based activities, greatly exceeding the World Health Organization's recommended daily limit of 2 hours. The incidence of screen use among children and adolescents is worrying, given its known link to obesity, cardiometabolic risk, and diabetes (Kushima et al., 2022). If they're busy playing with an iPad, smartphone, or television, all of which are highly entertaining, it can be challenging to get young children to engage in non-electronic playback time with devices to foster creativity, try to discover outdoors, and actually interact with other children to demonstrate social and communication skills (Domingues-Montanari, 2017).

## Objective

The convenience of current rules to limit screen time for children and high schoolers has been addressed due to a lack of credible evidence on the influence of screen time on wellbeing. There is evidence of a link between screen use and unhappiness in kids, but not for behavioural concerns, anxiety, pressure, or poverty considerations, identity, wellness, or social work.

- To determine if excessive screen usage has a negative impact on the verbal, emotional, and physical growth of children.
- To determine if children and teenagers are naturally drawn to screens; the idea is to teach them how to use them responsibly.
- Screens may help promote self-esteem and give numerous chances for learning and growth when used with good screen objectives and abilities.
- To look at the impact of screen time on children's mental health and behaviour.

## Screens effect on early childhood development and learning

Children, especially those who are under the age of three, develop quickly. Children learn through interacting with their surroundings and by studying and imitating the people in their lives. Overabundance of screen time can impair a child's ability to see and complete the regular tasks that they must do in order to perceive the environment, resulting in "tunnel vision" that can be detrimental to overall development (Kushima et al., 2022). According to research, infants under the age of two learn considerably more from a video than from another person, and it indicates that while children can view the television screen by the age of six months, they do not assimilate the content until they are two years old. They won't be disappointed, and they obviously didn't learn something from whatever is on the screen (Radesky & Christakis, 2016).

Children who spend excess time with computers eat more fast food and eat less fruits and vegetables, as well as getting less sleep and exercise (Stiglic & Viner, 2019). As a result, including healthy lifestyle choices into everyday routines, as well as limiting screen time, is critical. Many of the problems caused by screen use are due to inactivity. The idea is that time spent in front of a screen is time spent not exercising or participating in other physical activity. Children's sedentary behaviour has been related to poor physical, psychological, and mental wellness, and some research has connected screen use to an increase in children's inactive behaviour (Ashton & Beattie, 2019).

## Screen time affects sleep and communication

According to studies, having a shared discussion with children is essential for language development and community participation. In comparison to "passive" hearing or one-way interaction with a screen, in real life, it is the away "conversation" in which youngsters exchange facial characteristics and respond to one another that improves language and communication ability (Przybylski & Weinstein, 2018). As the night falls, sleeping patterns and the creation of serotonin, the sleep hormone, start in. Background light from screens, on the other hand, suppresses melatonin, which can contribute to sleep deprivation. Additionally, watching television and playing keeps both minds and bodies alert and busy, preventing us from falling asleep again (Kushima et al., 2022).

One study determined that children aged 6 to 12 months who'd been exposed to screens in the evening slept much less than those who were not exposed to screens in the evenings. Late-night screen usage can impair sleep in young teenagers and youths, so it's better to keep electronics out of the bedrooms (Radesky & Christakis, 2016). Students' behaviour and cognitive performance at school might be affected by excessive time spent on social media, as well as a lack of sleep, interfering with their capacity to concentrate. Obesity in children has been

linked to excessive screen time and lack of sleep, which can affect self-esteem and contribute to social isolation, as well as increased screen time (Duch et al. 2013).

### Screen time and well-being

There has been inconsistency in research on the relationship between screen time and more mental components of children's well-being. Some studies indicate a link between screen time and low happiness, while others find no link or even advantages from increased screen time (Vizcaino et al., 2020). As a result, others argue that additional study is needed before determining that screen time limitations are acceptable, claiming that valuable physician appointment time should not be allocated to addressing screen time unless there is adequate evidence of meaningful connections with well-being (Przybylski & Weinstein, 2017).

When it comes to prevention, determining the likely causes and consequences of poor emotional well-being is especially important for children and adolescents. Half of all psychological problems are caused in childhood (Holton & Nigg, 2020). As a result, there is an urgent need to identify characteristics linked to mental health issues in this population that can be modified, as most causes (such as hereditary component, trauma, and hardship) are quite difficult to modify. How children and teens use their leisure time is more flexible than the more difficult to change factors of mental illness (Vizcaino et al., 2020).

Children and teenagers are also more likely to have a smartphone (Limniou, Ascroft, & McLean, 2021), allowing them to be using computers in a broader range of situations. This might increase the risk of online addiction, obsessive gaming, or dishonest social media use, all of which have been linked to mental health problems (Satici & Uysal, 2015). Because cell phones may be used during the night or even taken into the bed, they may have a detrimental impact on sleep, leading to decreased sleep duration and/or quality (Marino et al., 2018). Smartphones may also be used during face-to-face social interactions, which may have a detrimental impact on such interactions and lessen their overall positive impact on happiness. Some academics have expressed similar concerns regarding the WHO's definition of gaming illness as a mental health condition, claiming that the links between gaming and psychological well-being are insufficiently strong or consistent to support such a classification (Twenge & Campbell, 2018). Teenagers had stronger links between screen usage in the day and low psychological well-being, than younger children (Figure 1).

### Depression, anxiety and screen time

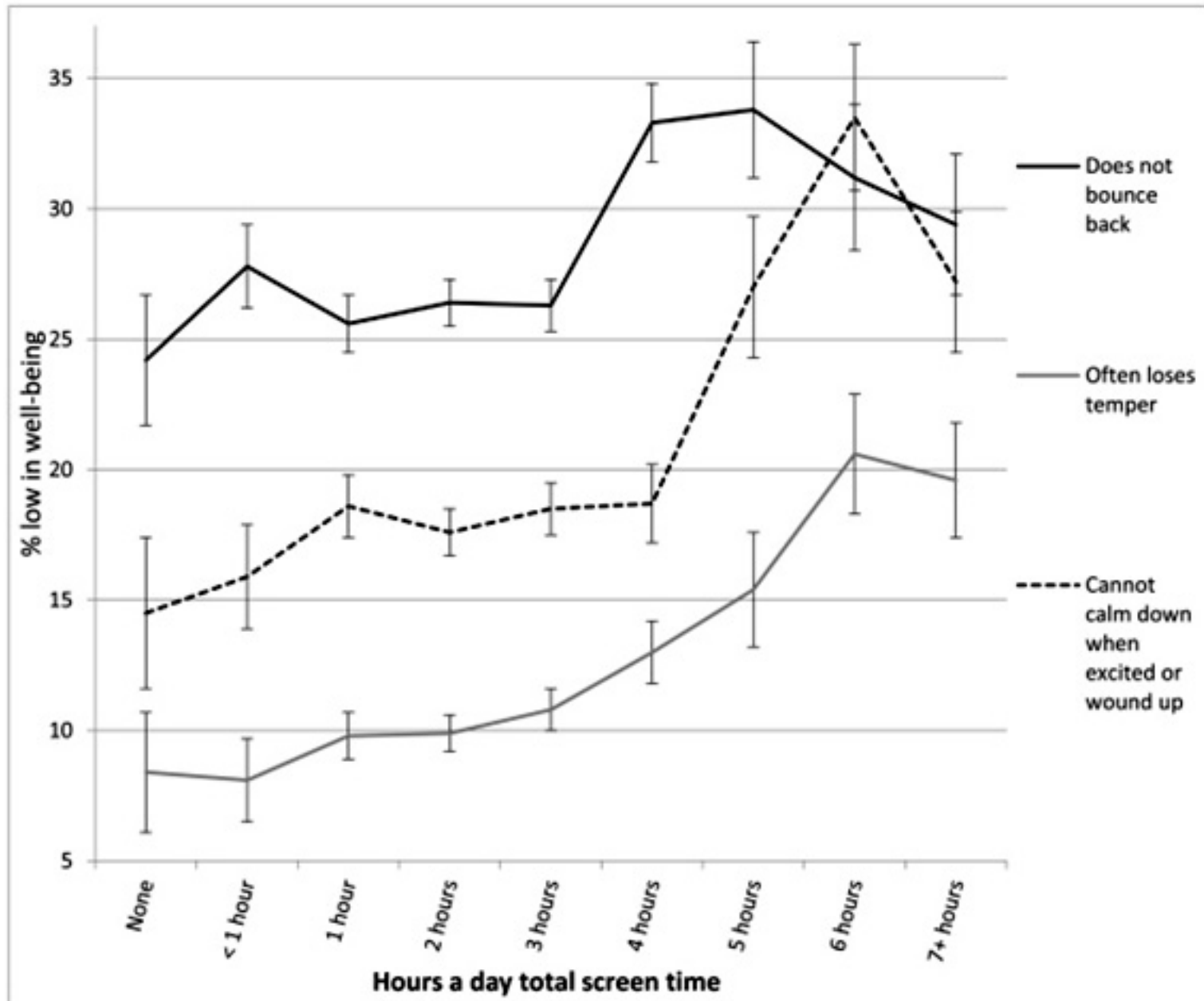
Children and teens who spend a lot of time in front of a screen had worse cognitive health than those who didn't. High-screen users were far more likely to have poor emotion management (losing their cool, arguing excessively, becoming impossible to get along well with), inability to finish activities, a lack of motivation, and trouble making friends (Duch et al. 2013). High users were also perceived by guardians as being much more impossible to prepare for and possessing less self-control, according to Cleland et al. (2018). Adolescents who smoked a lot of marijuana (vs. a little) were twice as likely to identify with depression or anxiety, or to need mental or behavioural health therapy. In 14- to 17-year-olds, moderate screen users were also much more likely to be dissatisfied, to be diagnosed with depression or anxiety, or to require behavioural health therapy. Non-users and low-users of screens did not have substantially different levels of happiness (Karadag & Can Yilmaz, 2022).

Children who used a lot of drugs (vs. a little) were also multiple times more likely to receive a diagnosis with anxiety and depression, or to need psychological or behavioural health therapy (Vizcaino et al., 2020). Moderate screen users were also much more likely than low screen users to be unhappy, and also being treated for depression or anxiety, or to require mental health therapy. The well-being of non-users and low-users of screens was not significantly different. Similarly, research from the United States discovered that computer use and online browsing time were not linked to sadness (Kushima et al., 2022), and that they only predicted higher anxiety among teenagers with an alcoholic father. In youngsters, there is a protective association between computer use and psychological suffering. As a result, the effects of computer use on juvenile mental health are varied, possibly due to methodological discrepancies between researchers (Ashton & Beattie, 2019).

Several studies have revealed no variation in satisfaction or psychological issues comparing youngsters who follow recommended screen usage limits and those who don't. Screen time may have small, favourable benefits on children and teenagers, according to some study (Kushima et al., 2022). According to some researchers, this shifting relationship is due to a 'U-shaped' relationship between screen use and wellbeing, in which using screens for short to moderate periods of time can have neutral to beneficial effects, but using screens for lengthy periods of time can have negative effects. Obesity and insufficient physical activity have been related to screen use (Stiglic & Viner, 2019).

There's some evidence to demonstrate that overall screen time and later depression symptoms have a very tiny to slight positive relationship. This link appears to be regulated by sex and levels of physical exercise. Only a few researchers have revealed evidence of a negative relationship between depression symptoms and screen use (Ashton & Beattie, 2019). The link between screen

Figure 1: Showing the link between Screen usage in a day with psychological well-being (Twenge & Campbell, 2018)



time and sadness differed depending on the type of screen content and how it was used. There was no evidence of a link between watching television and playing video games and developing depression. There was more evidence of a link between using a mobile phone and using a computer/internet and then becoming depressed. There was conflicting evidence of a link between social media use and eventual depression (Karadag & Can Yilmaz, 2022).

However, there's some evidence to indicate that overall screen time is linked to increased anxiety symptoms later on. The evidence on the relationship between anxiety and eventual total screen time was inconsistent, with one research finding no link between the two variables and another finding a link. When looking at individual screen devices or usage, no evidence was found of a link among screen time and anxiety (Stiglic & Viner, 2019).

### Screen time and autism

Many experts are beginning to feel that social environmental variables, such as electronic screen exposure, rather than merely biological ones such as genetic susceptibility, are contributing to the rise in the number of children diagnosed with autism (Ashton & Beattie, 2019). The more time spent in front of a screen, the more visible the autism-like symptoms become. Longer screen time meant less time for play, less time spent with caregivers, and less time for social connections. Furthermore, screen time was linked to language development in children: the younger the age, and the higher the amount of screen time exposure, the greater the influence on language development. Electronic media has been shown to have a harmful influence on language development, according to the study of (Karadag & Can Yilmaz, 2022).

High levels of exposure to tablets, cell phones, and television in youngsters under the age of two has been linked to ASD symptoms even as children grow. Duration of screen time, a postnatal important indicator, may be linked to ASD features and ASD-specific brain morphology. As a result, screen time throughout infancy, a time of fast growth, might be one of the learnt variables linked to ASD (Must et al., 2015). However, only a few randomized trial studies have investigated the link between protracted screen activities and ASD in youngsters. Moreover, since the episode of the COVID-19 pandemic, there has been a significant change in ways of life, with electronic gadgets acting as the primary way to communicate and social contact; as a consequence, children's screen time has increased across the world (Stiglic & Viner, 2019).

One researcher looked at the link between how much time spent on screen time or watching a video and overall self-esteem (Braig et al., 2018). The researcher found no association between time spent watching TV and self-esteem at two-year follow-up. They found that children who began observing less than two hours of video per day as a pattern had a neighbourly association with a concept of self from the beginning to follow-up, but children who

observed more than two hours of TV per day had a negative relationship with alteration in self-esteem from base point (Duch et al. 2013).

According to Karadag and Can Yilmaz (2022), who looked at the relationship between self-esteem and gaming usage, self-esteem was shown to be adversely linked with later frequency of videogame use in this study. Only a few researchers have looked into the link between screen usage and self-esteem. In each case, there was no indication of a long-term link between overall screen usage and self-esteem. According to some research, self-esteem is positively correlated with later device use, and negatively associated with following gaming use, and unrelated to eventual mobile phone use (Duch et al. 2013).

### Discussion

Some of the ambiguity around the consequences of screen use in youngsters may be related to the rapid advancement of technology. There are currently many different types of screens (televisions, computers, tablets, and smartphones) that may be used in a number of ways. As a result, when we discuss children's 'screen usage,' each of them may have a distinct impact. Using screens to keep in touch with peers and relatives may be beneficial for certain children and young adults. While there is evidence that social media may have negative consequences such as creating unhealthy comparisons to others, harassment, or exposure to harmful material, there is also evidence that it can have positive consequences. It is said that it aids youngsters in maintaining touch with others, developing friendships, and allowing them to experiment with new information and ideas (Braig et al., 2018).

According to a meta-analysis of Facebook studies, 'passive use,' or clicking through posts without participating with the material, was shown to reduce quality of life and life enjoyment, but 'energetic use,' or using Facebook to interact directly with each other or produce things, was not linked to these negative consequences, and may have a slight positive effect on emotional wellness (Stiglic & Viner, 2019). This demonstrates that how children interact with television, and also the type of media they use and how long they watch it for, can have a variety of effects on their mental health and well-being. Screens may also be used to actively improve mental health through computerised treatment. Computerized cognitive behavioural therapy (cCBT), for example, has been shown to be useful for children (ages 12 to 25) who are suffering or at risk of enduring mental stress (Karadag & Can Yilmaz, 2022).

It's worth noting that much of the research on screen usage in children and adolescents is cross-sectional, which means they look at the features of a group at a specific moment in time. This makes it impossible to say if screen usage causes particular results, or whether children who use screens frequently are also more likely to have certain physical and psychological consequences as a result of another common factor (Kushima et al., 2022). Childhood

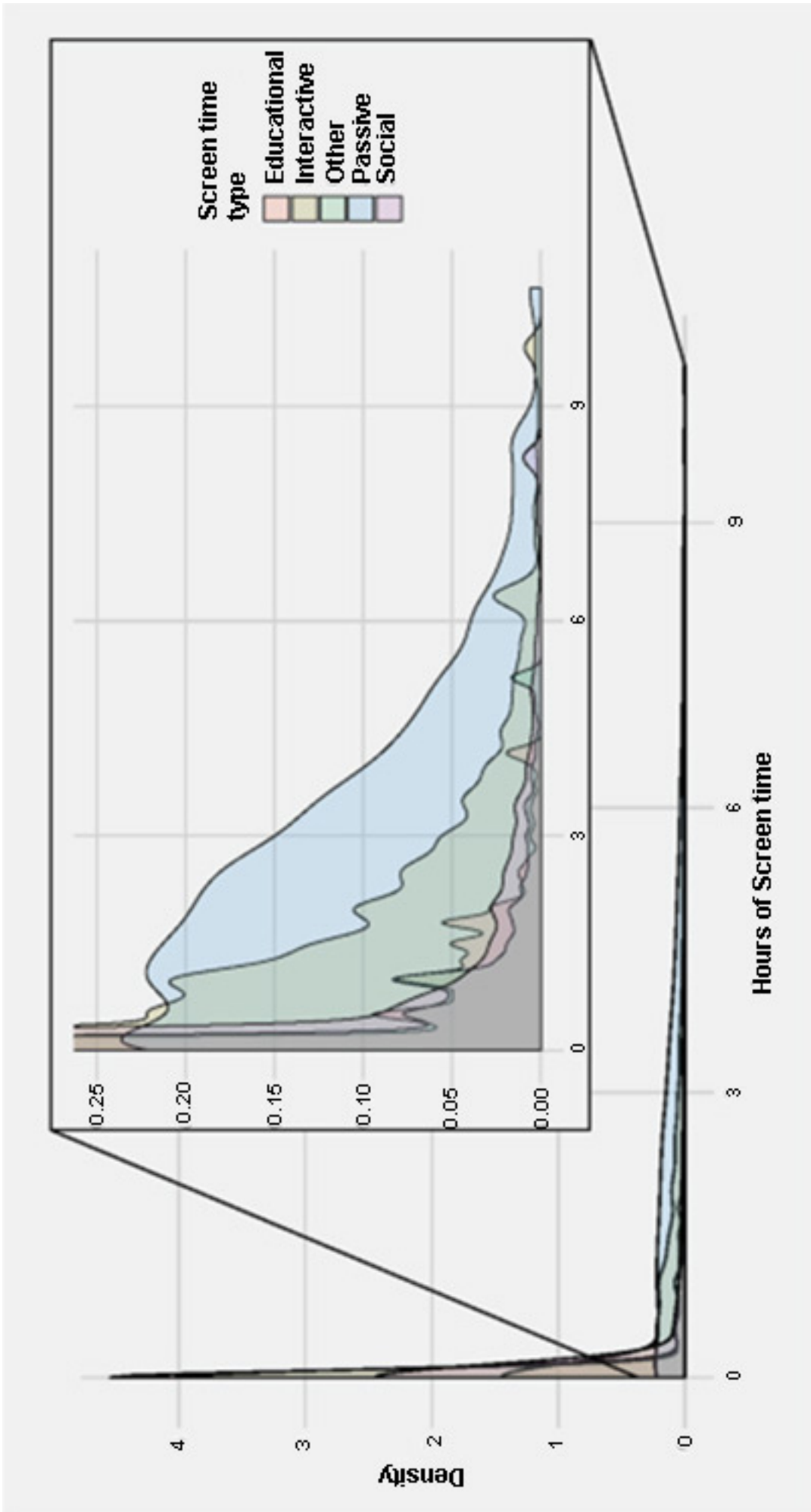


Figure 2: Showing the screen time with time categories Sanders et al., (2019)

and adolescent psychological disorders are expected to become one of the top causes of illness, death, and disability among children globally by 2020, according to the World Health Organization. Depression and anxiety are two of the most common causes of illness burden among teenagers (Patel & Sapovadia, 2020). According to epidemiological research, 5 to 9% of teenagers are clinically depressed, whereas 21% to 50% express low mood, with subclinical rates mirroring depressed mood rates (Stiglic & Viner, 2019). Exploratory analyses revealed that the screen time variables were strongly skewed, particularly for less common screen time categories (e.g., social screen time), where a large majority of individuals had no screen time (Figure 2) (Sanders et al., 2019).

The long-term consequences of screen time on the brains of children or adults due to phones and computers is not yet seen as they have only been widely available and inexpensive for around thirty years. As the use of technology has become more prevalent in children's and adolescent's life, so has interest in how these screen-based gadgets influence their health and wellness, as well as how to properly control and restrict their use (Kushima et al., 2022). Many of the problems caused by screen use are due to inactivity. The idea is that time spent in front of a screen is time spent not exercising or participating in other physical activity. Children's sedentary behaviour has been related to poor physical, psychological, and mental wellness and some researchers have connected screen use to an increase in children's inactive behaviour (Nagata et al., 2021).

There are also concerns that screen time could have an impact on teenage children's sleep, which is essential for physical and mental well-being. Children who are using screens before sleep get fewer hours of sleep, have poorer sleep quality, and are more tired, according to research (Kushima et al., 2022). Multiple studies have identified a relationship between screen use and behavioural and psychological outcomes in children and adolescents, with higher levels of screen use being connected to less physical exercise, a higher level of depression, and a worse feeling of well-being (Karadag & Can Yilmaz, 2022).

The average time spent and the various activities conducted online utilising digital devices are referred to as screen time. Screen time, for example, includes both the use of digital devices for labour (restricted hours of work or educational objectives) and for pleasure and amusement (Kowalski & Limber, 2013). The link between increasing screen usage and lower psychological health in kids might be explained in a variety of ways. Screen time might be used to replace time spent cultivating good interpersonal relationships. Nagata et al. (2021), recognised that children who spend a lot of time on screen-based activity may be distancing themselves socially. Furthermore, it is generally understood that a positive relational orientation is critical to healthy development, and increasing screen time can severely damage attachment connections, consequently impacting mood (Kushima et al., 2022).

Another method might be related to the nature of the screen exposure's content, context, or messaging. Computer/internet use, for example, can expose children to harassment, and despair and anxiety and has been linked to cyber bullying in children (Kowalski & Limber, 2013). Exposure to unreachable pictures that objectify the human body may also lead to emotions of despair and anxiety, according to social comparison theory and materialism theory (Nagata et al., 2021). Children who spend time next to electronic devices also have greater sleeping issues, which may impair their capacity to cope with stress, leading to feelings of despair or worry. Finally, screen time might take the place of time spent on physical exercise, which is troubling given earlier results that physical activity is linked to a reduction in mood and anxiety disorders (Stiglic & Viner, 2019) and increased rates of childhood obesity.

## Conclusion

In conclusion, children's screen time is not passive; digital media may contribute to promoting and support physical activity. Children, especially those above the age of three, respond to interactive programming that is entertaining, suited to them, and stimulates imitation or participation. Dynamic video games may encourage light-to-moderate or acceptable physical exercise in the near future. Families and child care providers may include more physical activity into daily routines by using fun, age-appropriate exercise (e.g., yoga or dance) and fitness apps or videogames. Outdoor physical exercise may be enhanced by using mobile devices with apps for experiencing the natural environment. Quality content bridges the gap between on- and off-screen experiences, encourages interaction with caregivers and peers, and encourages active, imaginative play.

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# Prevalence and Risk Factors of Pregnancy-Related Anxiety: A Systematic Review

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## Abstract

**Background:** Pregnancy is a unique period of life that can overwhelm an expectant mother with experiences of psychological ambivalence, concretized by emotional disturbances, sudden transitions from exhaustion to exaltation, or even mixed anxiety.

**Objective:** To determine the prevalence of pregnancy-related anxiety and its associated factors among pregnant women.

**Methods:** We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A structured literature review was carried out using the component of the PICO framework. The literature search was conducted in Medline, Ovid, Embase, Google Scholar, and PubMed. A combination of relevant search terms was used. Electronic searches were supplemented by manual searches of references of included studies and review articles. The duplicate citations were identified and removed.

**Results:** A total of 69 articles were identified through the searches, while 13 articles met the inclusion criteria. The characteristics and results of included studies were discussed, regarding the study design, screening tools, prevalence, onset, and risk factors of pregnancy-related anxiety.

**Conclusions:** Anxiety disorders are common during pregnancy. There is wide variability in its measurement, with a subsequently wide range in reported prevalence rates. Several risk factors are associated with pregnancy-related anxiety, such as younger age, low income, past history of stillbirth, unwanted pregnancy, current comorbidity, or mental illness.

**Key words:** Pregnancy, anxiety, onset, prevalence, risk factors, systematic review, PRISMA.



## Introduction

Pregnancy constitutes a critical time for the development of psychological illnesses (1). Therefore, it is not unusual for women to have concerns during their pregnancy. However, some women become affected by their anxiety to the extent that it interferes with their daily lives, and a considerable proportion of them suffer from significant anxiety symptoms (2).

Dennis et al. (3) reported that during pregnancy, 15.2% of women may have anxiety disorders. Anxiety during pregnancy is associated with poor maternal health, adverse birth outcomes, and negative behavioral and biological development for children across their lifespan (4-5). However, measures of generalized anxiety during pregnancy tend to explain only a small proportion of variation in these fetal health and birth outcomes (6).

During pregnancy, there are components of anxiety that are better defined as “pregnancy-related anxiety”, which is different from generalized anxieties and depression (7). It relates to the fear, worry, or apprehension surrounding pregnancy, childbirth, the health of the baby, and other pregnancy-specific social and financial issues (6). It also involves the fears and concerns about the woman’s physical appearance during pregnancy and her ability to meet expectations of herself as a parent (1).

The prevalence of pregnancy-related anxiety has been reported to vary widely from 6% to 29% in developed countries, with South Asia accounting for 32% (8). Jha et al. (9) reported that its magnitude accounts for from 1% to 26% in low- and middle-income nations.

Therefore, the purpose of this study was to determine the prevalence of pregnancy-related anxiety and its associated factors that may overwhelm an expectant mother.

Pregnancy-related anxiety has a special impact on health during pregnancy, and on the course of childbirth, in addition to child and maternal outcomes after delivery (10). Moreover, it has been linked to increased maternal mortality (11), preterm labor (12), impaired cognitive function among children (13), low birth weight (14), poor maternal bonding (15), and poorer child health and development (16). These associations have contributed to the increased research on pregnancy-related anxiety. However, as a construct, pregnancy-related anxiety is multidimensional and its main aspects appear to differ by country and context (17).

The variation in domains of pregnancy-related anxiety suggests that the use of tools originally developed to measure pregnancy-related anxiety in high-income countries may not be a valid or reliable approach to identify pregnancy-related anxiety in low- or middle-income countries, as these tools may fail to capture locally relevant components of this anxiety. This hinders the accurate identification of predictors of pregnancy-related anxiety and the development, evaluation, and implementation of appropriate interventions (6).

## Methods

### Research questions

- Q1: What is the prevalence of pregnancy-related anxiety in different parts of the world?
- Q2: What are the factors associated with pregnancy-related anxiety?

The PICO framework was followed to develop the review questions, as follows:

- **P** (Population): Pregnant women
- **I** (Intervention): Screening for pregnancy-related anxiety.
- **C** (Comparator): None
- **O** (Outcome): Positive results of anxiety during pregnancy.

### Literature Search

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A structured literature review was carried out using the component of the PICO framework. The literature search was conducted in Medline, Ovid, Embase, Google Scholar, and PubMed.

Combinations of the following search terms were used: *pregnancy, perinatal, prenatal, anxiety disorders, onset, course, trajectory, and prevalence*. No search for grey literature or unpublished literature was performed.

Electronic searches were supplemented by manual searches of references of included studies and review articles. The duplicate citations were identified and removed.

Two reviewers (AFA and NAA) independently assessed the quality of studies using the Newcastle–Ottawa Scale quality assessment tool for observational studies. To reach a consensus, all different opinions about quality assessment were discussed with a third reviewer (ASA).

### Inclusion and exclusion criteria

We included studies that met the following criteria:

- Free full-text articles recently published in the English language during the last three years (2020-2023).
- Articles reporting on the prevalence, onset, and/or course of any anxiety disorders during pregnancy.

The exclusion criteria were:

- Single case reports or case series, abstracts, review articles, and commentaries to articles.
- Articles reporting exclusively on the postpartum period.

### Data extraction

The following data were extracted from retrieved articles: publication year, study characteristics, sample size, research design, assessment points, measures used, number of assessments during pregnancy, onset, course, and prevalence rates.

## Results and Discussion

### Study characteristics

Figure (1) presents the PRISMA flow chart, showing that of 69 articles identified through the searches, 13 articles met the inclusion criteria of reporting prevalence, onset, and/or course of any anxiety disorder during pregnancy. The characteristics and results of included studies are summarized in Table (1).

### Study design

A total of five studies followed a prospective research design (5; 18-21), while seven studies followed a cross-sectional design (8; 22-27); and only one study was retrospective (28).

### Prevalence of pregnancy-related anxiety

Our study indicated that anxiety disorders are common during pregnancy and that prevalence rates of anxiety disorders during pregnancy vary considerably between various studies. Prevalence rates of anxiety during pregnancy were reported in six studies (22-27) and ranged from 10.4% in Qatar (22) to as high as 70.3% in Lebanon (26). This wide variation in prevalence of anxiety during pregnancy may reflect the impact of other additional factors beside pregnancy. One study in China reported the prevalence rates of pregnancy-related anxiety for each trimester separately (27), being 20.8%, 20.8%, and 23.0% in the 1st, 2nd, and 3rd trimesters, respectively.

Bjelica et al. (29) stated that pregnancy is a unique period of life that overwhelms each expectant mother with experiences of psychological ambivalence, concretized by emotional disturbances, sudden transitions from exhaustion to exaltation, or even mixed anxiety and depressive disorders. Moreover, pregnancy might generate certain apprehensions regarding its progress and delivery outcomes, hence making the pregnant woman susceptible to mental health challenges, according to the extent of her adaptive or coping abilities.

Viswasam et al. (30) added that, if the woman is particularly sensitive to such changes, perhaps as a result of heightened anxiety sensitivity, they can be instrumental in precipitating panic attacks. Elevated levels of progesterone, estradiol, and cortisol during pregnancy have also been implicated in the etiology of panic attacks. In addition, there are psychological vulnerabilities specific to pregnancy, which include body and health-centered concerns.

These findings indicate that pregnancy may be a specific risk factor for the occurrence and/or exacerbation of anxiety disorders. A possible reason for the occurrence of anxiety during pregnancy could be traced back to experienced sudden changes during pregnancy, such as increased heart and respiratory rates, chest tightness, and shortness of breath (31).

### Screening tools for anxiety

This wide variation in reported prevalence rates of pregnancy-related anxiety may be attributed to differences in study populations, with cultural multiplicity and sociodemographic diversity. Moreover, some studies recruited pregnant women during all trimesters, while others recruited them during their second or third trimesters.

In addition, different tools were used to screen for anxiety during pregnancy by each study. The general health questionnaire (GHQ) was used by Insan et al. (28), while the Patient Health Questionnaire-9 was used by Gerges et al. (26) in Lebanon. Various versions of the Pregnancy-Related Anxiety Questionnaire were used by Naja et al. (22) in Qatar, Abegaz et al. (24) in Ethiopia, in addition to Huang et al. (25), and Zhou et al. (27) in China. EPDS anxiety subscale was used by Li et al. (5) in Canada, as well as Frigerio & Molteni (21) in Italy. Other screening tools for anxiety included the Hopkins Symptom Checklist in Norway by Thiel et al. (18), the Perinatal Anxiety Screening Scale in Nigeria by Akinsulore et al. (23), the State-Trait Anxiety Inventory in the UK by Slade et al. (19), and the Perinatal Anxiety Screening scale in India by Dwivedi et al. (20).

### Onset of anxiety during pregnancy

Most included studies reported that pregnancy-related anxiety was most frequently manifested during the second trimester (8; 22) or third trimester (20;23).

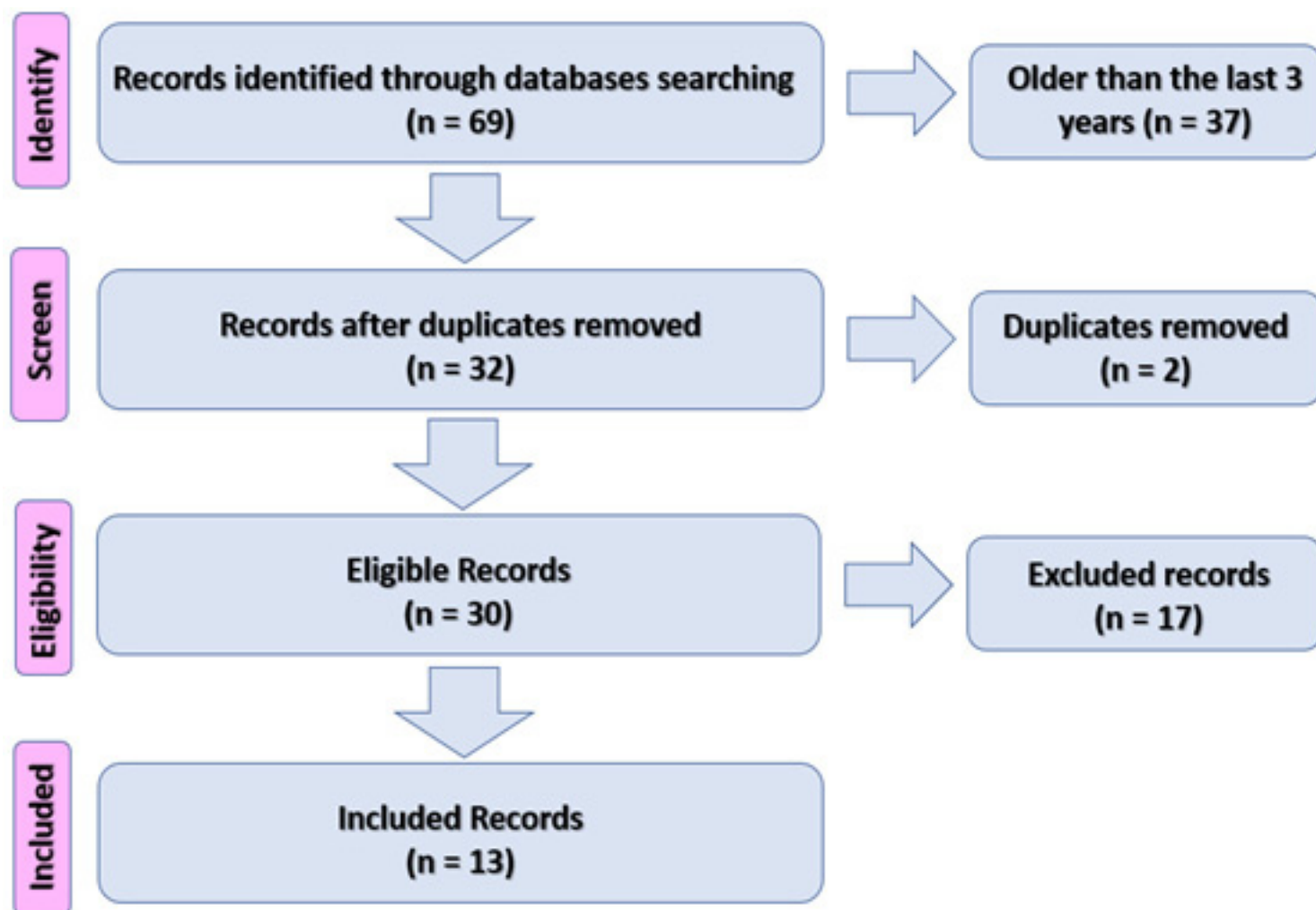
### Risk factors for pregnancy-related anxiety

Pregnant women with comorbid hypertension past history of miscarriage, complicated pregnancy, or maternal worries. Moreover, extroversion, and social support from partners were reported as significant influential factors associated with pregnancy-related anxiety (23).

A past history of stillbirth, unwanted pregnancy, current comorbidity, and mental illness predicts pregnancy-related anxiety. However, unplanned pregnancy and current illness failed to show a significant association with pregnancy-related anxiety. The moderating effect of perceived social support and resilience level on pregnancy-related anxiety was statistically significant. Previous history of mental illness and unwanted pregnancy was shown to be statistically associated with anxiety. However, parity failed to show any significant association with antenatal anxiety (22).

Tarafa et al. (8) reported that being pregnant at a young age is a risk factor for pregnancy-related anxiety. They explained this finding by the high fears of birth. At an early age, the pregnant mother might feel worried about the viability of her developing fetus.

Figure 1: PRISMA flow chart



Trafata et al. (8) added that low income was significantly associated with pregnant-related anxiety. They explained that low-income pregnant women may be obsessed with issues associated with parenting, such as higher financial expenses, and the lack of antenatal healthcare services. The anticipated financial costs of maintaining a baby and other concomitant life stressors may induce extra pressure during the antenatal time, provoking anxiety.

Kim et al. (32) argued that pregnant mothers with lower socioeconomic status usually receive limited prenatal service at higher rates than their middle and high-socioeconomic-status counterparts, and lower socioeconomic status has been linked with a high risk of hypertension, diabetes, and other complications related to pregnancy.

Tarafa et al. (8) added that pregnant mothers who have poor social support had a higher chance of pregnancy-related anxiety compared to pregnant mothers who had strong social support. They explained this finding by that pregnant mothers who have poor social support might not be happy with their families and have no good interactions with their social environment. Therefore, they may develop social withdrawal, become depressed with lower coping ability and eventually develop more anxiety.

### Limitations

This study included free full-text articles published in English language only and the focus was on the last 3 years. There were only 13 studies investigating the prevalence, onset, and course of anxiety disorders during pregnancy. The design of one study was retrospective, with the associated risk of recall bias.

Moreover, some studies reported prevalence rates at a particular trimester, while others did so at “any time during pregnancy”, thereby limiting the ability to combine data from the available studies. Similarly, the reported high variability in study tools provided high heterogeneity between studies.

In addition, the included studies did not provide sufficient data on the factors that may influence the prevalence, and onset of anxiety disorders during pregnancy, such as levels of stress and social support, the occurrence of any traumatic events, etc.

Table (1): Summary of the main results

Authors	Year	Country	Study design	No. of participants	Gestational age	Study tools	Prevalence
Insan et al. (28)	2020	UK	Retrospective	7824	26-28 <sup>th</sup> weeks	GHQ	--
Naja et al. (22)	2020	Qatar	Cross-sectional	800	1 <sup>st</sup> -3 <sup>rd</sup> trimesters	PRAQ	10.4%
Thiel et al. (28)	2020	Norway	Prospective	2206	17-32 <sup>nd</sup> weeks	SCL-A, MINI	--
Akinsulore et al. (23)	2021	Nigeria	Cross-sectional	230	24 weeks	PASS, CWS, BFI-10, MSSS	43.5%
Li et al. (5)	2021	Canada	Prospective	555	16-32 weeks	EPDS anxiety scale	--
Slade et al. (19)	2021	UK	Prospective	1286	20 weeks	STAI, PSS	--
Abegaz et al. (24)	2022	Ethiopia	Cross-sectional	423	1 <sup>st</sup> -3 <sup>rd</sup> trimesters	PRAQ	43.9%
Frigerio & Molteni (21)	2022	Italy	Prospective	110	3 <sup>rd</sup> trimester	STAI-S, EPDS	--
Huang et al. (25)	2022	China	Cross-sectional	579	≥ 11 weeks	C-PRA	41.4%
Tarafa et al. (8)	2022	Ethiopia	Cross-sectional	406	3 <sup>rd</sup> trimester	PRAQ	32.7%
Dwivedi et al. (20)	2023	India	Prospective	200	3 <sup>rd</sup> trimester	PASS	--
Gerges et al. (26)	2023	Lebanon	Cross-sectional	433	1 <sup>st</sup> -3 <sup>rd</sup> trimesters	PHQ-9	70.3%
Zhou et al. (27)	2023	China	Cross-sectional	3154	1 <sup>st</sup> -3 <sup>rd</sup> trimesters	PRAQ	20.8%, 20.8% and 23.0% in the 1 <sup>st</sup> , 2 <sup>nd</sup> , and 3 <sup>rd</sup> trimesters, respectively

BFI-10: Big Five Personality Inventory

EPDS: Edinburgh Postnatal Depression Scale

MINI: Mini-International Neuropsychiatric Interview

PHQ-9: Patient Health Questionnaire-9

SCL-A: The Hopkins Symptom Checklist

CWS: Cambridge Worry Scale

GHQ: General Health Questionnaire

PRAQ: Pregnancy-related anxiety questionnaire

STAI: State-Trait Anxiety Inventory

C-PRA: Chinese pregnancy-related anxiety scale

MSSS: Maternal Social Support Scale

PASS: Perinatal Anxiety Screening scale

PSS: Pregnancy-stress scale

STAI-S State-Trait Anxiety Questionnaire

## Conclusions

This systematic review indicates that anxiety disorders are common during pregnancy. However, assessed studies revealed wide variability in the measurement of pregnancy-related anxiety, with a subsequently wide range in reported prevalence rates.

Several risk factors are associated with pregnancy-related anxiety, such as younger age, low income, past history of stillbirth, unwanted pregnancy, current comorbidity, or mental illness. Moreover, perceived social support is associated with a lower prevalence of pregnancy-related anxiety.

The findings of the present study have important clinical implications, related to pregnancy-related anxiety, including a need for prevention, early diagnosis, and its management. However, it is necessary to identify pregnancy-related anxiety, which may necessitate treatment, and anxiety due to real-life matters and considerations, such as societal/financial issues concomitant with pregnancy. Therefore, obstetricians, psychiatrists and family physicians should be aware of pregnancy-related anxiety and their effect on the mother and fetus. Nevertheless, there is a pressing need to further study this important topic and to focus on the quality of the used screening tools, to validate their measurements.

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# Autism Spectrum Disorders in Children

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## Abstract

**Background:** Autism Spectrum Disorders (ASDs) describe a category of neurodevelopmental disorders in which individuals experience difficulties of social interaction and age-appropriate play and struggle to establish healthy peer interactions at their stage of development. This study will address the various aspects of Autism in children including clinical symptoms, evaluation, diagnosis and widely used medication or care.

**Methodology:** The search strategy involved utilizing two primary sources for obtaining relevant literature: Google Scholar and PubMed. The inclusion criteria comprised articles published in peer-reviewed journals, written in English, and focusing on ASD in children. Studies with diverse designs, including experimental, observational, and review studies, were considered.

**Results:** While children with autism spectrum disorders share many characteristics with children that have other developmental disorders and can benefit from many of the same educational strategies, they pose specific challenges for families, teachers, and others who collaborate with them. A deficiency in non-verbal and verbal communication requires a great deal of effort and ability, including in teaching basic knowledge. Special challenges in social interaction

(e.g., joint attention) may require more individual instruction than most children to gain and retain their children's attention. Furthermore, ordinary social interactions between peers do not typically take place without active preparation and ongoing adult structuring in the child's environment.

**Conclusion:** The lack of traditional friendships and peer relationships influences child motivation structures and the sense of experience. Adequate social experiences can be some of the most challenging and valuable lessons a child with autism spectrum disorders can learn.

**Keywords:** ASD (Autism Spectrum Disorders), QOL (Quality Of Life), neurodevelopmental conditions, PA (Physical Activity), DSM, ICD

## Introduction

Autism Spectrum Diseases (ASDs) are a group of neurodevelopmental disorders characterized by social interaction and age-appropriate play challenges, as well as the inability to build meaningful peer connections at their developmental level [1]. Children with ASD prefer passive play and maladaptive behavior and are less likely to voluntarily engage in organized leisure activities like sports [2].

It may be a result of their substantial impairments in motor development and physical activity (PA) [3]. Social and behavioral problems associated with autism spectrum disorder can limit children's participation in physical activity and recreation programs that would eventually eliminate their inactivity [4]. Physical inactivity predisposes children with autism spectrum disorder to many comorbidities, including overweight and obesity [5]. In order to identify the key links of physical activity, previous research has also examined social variables as important determinants of ASD physical activity among children [6]. For instance, Pan [7] discovered that children with ASD who had a lower level of social contact with adults also had a lower level of physical activity. Indeed, while children with ASD receive early recovery treatments to improve day-to-day success and increase physical activity, the quality of life dimension of physical activity and leisure (QOL) is disregarded in children with ASD and their families [8].

It is a challenging task for parents and caregivers to meet the needs of infants while at the same time meeting the needs of children with those of the family or guardians. Therefore, research investigating QOL in a wide variety of individuals with ASD have recently shown that adults with ASD have lower scores of well-being measures [9,10] and children also have a sub ideal outcome [11,12]. The objective of this study is to conduct a comprehensive and systematic search of the literature on Autism Spectrum Disorders (ASD) in children. The research aims to gather relevant information, identify key findings, and provide an overview of the current knowledge and research trends in the field.

## Methodology

### Search Strategy:

The search strategy involved utilizing two primary sources for obtaining relevant literature: Google Scholar and PubMed. These sources were selected due to their extensive coverage of academic and scientific publications in various disciplines, including medical and psychological research.

### Search Terms:

A set of carefully chosen search terms was used to ensure the retrieval of relevant articles related to Autism Spectrum Disorders in children. The search terms included variations and combinations of the following keywords: "autism spectrum disorder," "ASD," "child," "pediatric," "diagnosis," "treatment," "intervention," "epidemiology,"

"etiology," "genetics," "neurodevelopment," and "behavioral symptoms."

### Inclusion and Exclusion Criteria:

In order to focus the search and select appropriate articles, specific inclusion and exclusion criteria were applied. The inclusion criteria comprised articles published in peer-reviewed journals, written in English, and focusing on ASD in children. Studies with diverse designs, including experimental, observational, and review studies, were considered. On the other hand, articles that were not directly related to ASD in children, conference abstracts, dissertations, and non-peer-reviewed sources were excluded from the search.

### Search Process:

The search process was conducted in two main stages. In the initial stage, a preliminary search was performed using the identified search terms in both Google Scholar and PubMed. The search results were reviewed, and duplicate articles were eliminated. In the subsequent stage, a more refined search was conducted by screening the titles and abstracts of the remaining articles to assess their relevance to the research objective. Full-text articles were obtained for the potentially relevant studies and further evaluated for inclusion. The findings of this literature search was synthesized and reported in a comprehensive manner. The results were organized into relevant themes and subtopics, supported by evidence from the selected studies.

## Clinical Picture

### Overview:

Autism is a neurodevelopmental disorder characterized by challenges in social interaction and communication, as well as the presence of restricted and repetitive patterns of behavior [13]. Symptoms pertaining to their child's well-being are commonly identified by parents throughout the initial three years of the child's life [1–3]. Signs of autism often exhibit a gradual progression, while certain children may manifest a regression in their communicative and social abilities subsequent to their developmental growth [14].

Risk factors that can potentially affect pregnancy outcomes encompass several factors such as infections, including rubella, exposure to toxins such as valproic acid, alcohol, cocaine, pesticides, lead, and air pollution, as well as conditions such as fetal growth restriction and autoimmune illnesses [15]. Controversies arise in relation to specific environmental factors that are commonly discussed, one of which is the vaccine theory. It is worth noting that this theory has been thoroughly debunked [16]. The condition of autism has an impact on the transmission of neural information and the binding and organization of nerve cells and their synapses. However, the precise mechanisms behind these processes are not yet fully understood [5].

### Causes:

The existence of a shared etiology across the genetic, cognitive, and neurological domains of the characteristic triad of autism symptoms has been widely acknowledged



in the literature [17]. Autism is known to possess a robust genetic foundation; yet, the underlying genetics of autism are intricate and the extent to which Autism Spectrum Disorder (ASD) is elucidated by atypical mutations with substantial impacts or by infrequent interactions among multiple genes including common genetic variations remains uncertain [18]. Numerous genes associated with autism have been uncovered through the process of sequencing the genomes of individuals affected by the condition, as well as their relatives [19].

In general, it is observed that autism spectrum disorder (ASD) does not exhibit a Mendelian inheritance pattern, characterized by a single-gene mutation or a single defect in a chromosome. Furthermore, none of the genetic disorders associated with ASD have been demonstrated to exclusively induce ASD [20]. The presence of a substantial population of individuals with autism who lack a familial history of the disorder may be attributed to spontaneous structural alterations, such as deletions, duplications, or inversions of genetic material occurring during the process of meiosis [21]. There is a possibility that autism is subject to under-diagnosis among women and girls due to the prevailing assumption that it primarily affects males [22], but genetic phenomena such as imprinting and X-linking that increase the prevalence and severity of male disorders, and hypotheses have been put forward for a genetic explanation why males are more frequently diagnosed, such as imprinted brain theory and severe male brain theory [22].

The impact of maternal nutrition and inflammation on fetal neurodevelopment is evident during the pre-conception and prenatal periods. There exists a correlation between intrauterine growth restriction and autism spectrum disorder (ASD) in both full-term and preterm infants. Maternal inflammatory and autoimmune disorders have the potential to inflict damage onto embryonic tissues, exacerbate hereditary abnormalities, or adversely affect the neurological system. Exposure to contaminated air, particularly heavy metals and particulate matter, during pregnancy has been associated with an elevated likelihood of autistic spectrum disorder [23].

#### **Characteristics:**

Autistic individuals may exhibit significant impairments in particular domains, while demonstrating typical or exceptional abilities in others. The manifestation of symptoms often begins to appear gradually after the age of six months, with full development typically observed between the ages of two and three years. These symptoms have a tendency to remain into adulthood, albeit in a less severe manner [24]. It is distinguished by a unique triad of symptoms: impaired social contact, impaired speech, and repetitive conduct. Other common features, such as abnormal eating, are not necessary for diagnosis [24]. Specific manifestations of autism occur in the general population and tend not to be substantially associated in the absence of a clear distinction between pathologically severe and usual characteristics [24].

#### **Social development:**

Behavioral differences differentiate autism and related autism spectrum disorders from many other developmental conditions [25]. Individuals diagnosed with autism spectrum disorder (ASD) may experience challenges in cognitive functioning and commonly exhibit deficits in empathic abilities that are typically observed in neurotypical individuals. Atypical social conduct manifests during the early stages of development. Infants with autism spectrum disorder (ASD) have diminished engagement with social cues, displaying reduced frequency of smiling and limited attention towards others. Furthermore, they demonstrate decreased responsiveness to their own name. Autistic toddlers exhibit notable deviations from social standards, such as reduced eye-to-eye contact and limited utilization of basic gestures, like pointing, as a means of communication [26]. Children between the ages of three and five who have been diagnosed with autism spectrum disorder (ASD) exhibit reduced tendencies to display social awareness, initiate spontaneous interactions with others, imitate and respond to emotions, engage in non-verbal communication, and establish connections with peers. However, it is important to note that children indeed form emotional bonds with their primary caregivers [27]. The majority of children diagnosed with autism have a notable decrease in attachment stability when compared to children without autism. However, this discrepancy diminishes in children who demonstrate higher levels of cognitive development or exhibit less obvious autistic traits. Individuals with Autism Spectrum Disorder (ASD) who are in the older age group have poorer performance on assessments measuring facial and emotional identification. This observed decline in performance may be attributed, at least in part, to a diminished capacity to accurately identify and articulate one's own feelings [28].

#### **Communication:**

It has been observed that a significant proportion, ranging from around one-third to half, of individuals diagnosed with autism spectrum disorder exhibit limited ability to generate sufficient spontaneous speech to effectively meet their daily communication requirements [29]. Differences in communication can manifest early in infancy and encompass delayed onset of vocalization, erratic motor behaviors, diminished responsiveness, and vocal patterns that do not align with those of the primary caregiver. During the second and third years of development, individuals diagnosed with autism exhibit less regularity and complexity in their sentence structures, consonant usage, phrase formation, and word combinations. Furthermore, their gestures are less commonly integrated with verbal expressions. Children diagnosed with autism spectrum disorder (ASD) exhibit a reduced tendency to engage in demanding behaviors or actively express their experiences, while demonstrating a heightened inclination to engage in echolalia (i.e., the repetition of words or phrases said by others) and pronoun reversal [30]. The phenomenon of joint attention has been shown to play a crucial role in the acquisition of speech skills, and it has been noted that deficiencies in joint attention abilities might serve as a distinguishing factor between newborns diagnosed with Autism Spectrum Disorder (ASD) and those without [31].

**Repetitive behaviors:**

Autistic individuals can exhibit several types of repetitive or restricted behaviors, which are classified as follows by the Repetitive Behavior Scale-Revised (RBS-R) [32]:

- Stereotyped behaviors: repeated motions, such as hand flapping, head spinning, or body rocking.
- Compulsive behavior: time-consuming activities designed to alleviate the discomfort that a person feels compelled to conduct regularly or in compliance with strict laws, such as putting items in a certain order, inspecting things, or hand washing.
- Sameness: resistance to change; for example, insisting that furniture should not be moved or refusing to be interrupted.
- Ritualistic behavior: an unchanging pattern of daily activities, such as an unchanging menu or a dressing ritual. It is closely linked to the sameness and an independent analysis proposed merging the two factors.
- Restricted passions: passions or fixations that are irregular in nature or strength of emphasis, such as concern for a particular television show, toy, or game.
- Self-injury: actions such as eye-poking, skin-picking, hand-biting, and head-banging.

No single repetitive or self-injurious behavior appears to be specific to autism, but autism appears to have an increased pattern of occurrence and severity of such behavior.

**Other symptoms**

Autistic individuals may have symptoms that are independent of diagnosis, which can affect the patient or the family [26]. It has been estimated that a small percentage, ranging from 0.5% to 10% of individuals diagnosed with Autism Spectrum Disorder (ASD) have outstanding abilities. These abilities can vary, encompassing specialized skills like recollection of trivia, as well as the exceptionally unusual capabilities observed in brilliant autistic scholars [33]. Many people with ASD have superior vision and attention abilities relative to the general population [12]. Sensory abnormalities are observed in a majority exceeding 90% of individuals diagnosed with autism spectrum disorder (ASD), with certain anomalies recognized as integral characteristics. However, the existing evidence does not definitively establish that sensory symptoms serve as discriminative factors distinguishing autism from alternative developmental diseases [34]. Differences are greater for under-responsibility (e.g. walking into things) than for over-responsibility (e.g. noise distress) or for sensation-seeking (e.g. rhythmic movements) [8]. Approximately 60–80% of autistic people have motor signs that involve weak muscle tone, poor motor planning, and toe walking; deficiencies in motor control are pervasive acrobatics.

Gastrointestinal disorders are one of the most often associated medical conditions in people with autism [35]. These are related to increased social dysfunction, irritability, issues with behavior and sleep, language disorder and mood changes [36].

**Pathophysiology:**

The manifestations of autism can be attributed to neurodevelopmental alterations in diverse cerebral regions. The etiology of autism remains poorly understood. The function can be categorized into two domains: the pathophysiology of brain structures and processes related to autism, and the neuropsychological connections between brain structures and behaviors. Behaviors often exhibit many pathophysiological mechanisms [37]. Evidence suggests that defects in the intestinal brain axis may be involved [38,39]. Neural connections and the immune system are mechanisms that can cause diseases of the intestine to spread to the brain [38].

Many lines of evidence point to synaptic dysfunction as a cause of autism (5). Several uncommon mutations can contribute to autism by disrupting certain synaptic pathways, such as those involved in cell adhesion [40]. Research conducted on mice using gene substitution studies has revealed a strong association between autistic symptoms and subsequent developmental processes that rely on synaptic activity and activity-dependent modifications. The teratogens that are currently identified as potential causes of birth defects, including autism, seem to exert their effects during the initial eight weeks following conception. While this does not entirely eliminate the potential for autism to be influenced or initiated at a later stage, substantial evidence suggests that autism manifests early in the developmental process [41].

**Assessment and Diagnosis:**

Diagnosis is focused on actions, not cause or mechanism [42]. Under the DSM-5, autism is characterized by recurrent deficiencies in social communication and interaction in various contexts, as well as limited, repeated patterns of behavior, interest, or operation. These deficits are present in early childhood, usually before the age of three, and lead to clinically significant functional impairment. Sample symptoms include lack of social or emotional reciprocity, stereotypical and repetitive use of language or idiosyncratic language, and persistent concern for unusual objects. The disruption must not be better accounted for by Rett syndrome, cognitive impairment or global developmental delay [14]. There are several diagnostic tools available. Both are widely used in autism research: the Autism Diagnostic Interview-Revised (ADI-R) is a semi-structured parent interview, and the Autism Diagnostic Assessment Schedule (ADOS) uses observation and interaction with the infant. The Childhood Autism Rating Scale (CARS) is commonly used in clinical settings to determine the extent of autism based on child observation [26]. Clinical genetic assessments are often conducted once ASD has been diagnosed, especially when other symptoms already suggest a genetic cause [43]. Although genetic technology allows clinical geneticists to link an estimated 40 percent of cases to genetic causes, consensus guidelines in the US and the UK are characterized by high-resolution chromosome and fragile X testing [44]. A genotype-first diagnostic model has been suggested, which would systematically determine the differences in the number of copies of the genome [45].

ASD may still be diagnosed at the age of 14 months, but diagnosis has become more stable over the first three years of life: for example, a one-year-old who meets the diagnostic criteria for ASD is less likely than a three-year-old to continue to do so a few years later [1]. In the United Kingdom, the National Autism Program for Children suggests a period of 30 weeks from first concern to completed diagnosis [14]. Under-diagnosis and over-diagnosis are issues in rare cases, and a significant part of the recent rise in the number of confirmed ASD cases is possibly due to changes in diagnostic practices. The prevalence of drug treatment services and the extension of benefits have provided clinicians opportunities to diagnose ASD, resulting in some over-diagnosis of children with unclear symptoms. Alternatively, the cost of screening and diagnosis and the difficulty of obtaining payment can hinder or delay diagnosis [46]. Autism among visually impaired people is particularly difficult to diagnose, partly because most of its diagnostic criteria depend on vision, and partly because of autistic symptoms similarity with those of common blindness or blindness syndromes [46].

### Management:

The primary objectives in the provision of care for children diagnosed with autism spectrum disorder (ASD) are to mitigate the impact of related impairments and alleviate the distress experienced by families, while simultaneously enhancing their overall quality of life and promoting their ability to live independently. Typically, those with higher IQs exhibit a greater propensity for positive treatment response and improved health outcomes. Various approaches can be considered and tailored to meet the individual needs of the child. Parents and the educational institution play a crucial role as the principal sources of treatment. Services will be provided by professionals such as clinical therapists, special education instructors, speech pathologists, and certified counselors. Intervention studies encounter methodological challenges that hinder the establishment of definitive findings on efficacy. In recent years, there has been notable advancement in the development of evidence-based treatments [4,8]. While there is some favorable evidence indicating the potential benefits of certain psychosocial interventions compared to no treatment, it is important to note that the methodological quality of systematic reviews in this area has generally been subpar. Additionally, the clinical outcomes of these interventions remain largely uncertain, and there is limited evidence available regarding the comparative effectiveness of different treatment options [11]. Intensive and prolonged special education services, coupled with early behavioral therapy, have the potential to facilitate the development of self-care, communication, and work skills in children. Furthermore, such interventions can enhance overall functioning and reduce the occurrence of symptoms and maladaptive behaviors. However, it is worth noting that the notion that intervention at approximately three years of age holds particular significance lacks empirical support. Although there is limited evidence supporting the efficacy of medications in alleviating core symptoms, they may be prescribed to address related symptoms as irritation, inattention, or repetitive patterns of behavior [4,5].

### Education:

Commonly employed educational tactics encompass a range of interventions such as applied behavioral analysis (ABA), developmental models, structured instruction, speech and language therapy, social skills treatment, and occupational therapy. Within these methodologies, therapeutic interventions frequently involve thorough discussions of autistic features or focus specifically on a particular domain of impairment. One intervention option employs a parent-training model, which instructs parents on the implementation of several Applied Behavior Analysis (ABA) and Developmental Social-Pragmatic (DSP) techniques. This approach empowers parents to distribute their own interventions. Several digital signal processing (DSP) services have been developed with the aim of facilitating intervention systems that can be implemented by parents in their own homes. Although parent training models have been recently developed, they have exhibited efficacy in numerous studies and have been examined as a potentially efficacious type of caregiving [47].

Recent research has demonstrated the efficacy of delayed, thorough Applied Behavior Analysis (ABA) therapy in augmenting communicative and social functioning among preschool-aged children. Additionally, it is widely acknowledged that this form of intervention significantly improves the scholastic achievement of children within this developmental stage. Similarly, the utilization of a pedagogical strategy by educators that integrates a more authentic framework of Applied Behavior Analysis (ABA) in conjunction with a developmental cognitive functional approach becomes advantageous in augmenting social communication proficiencies in young children. However, it is worth noting that there is limited empirical backing for its efficacy in addressing comprehensive symptoms. There remains a lack of effective dissemination of neuropsychological research findings to students, leading to a disparity between the implications of these studies and the content of educational instruction [48].

### Medication:

Pharmaceutical interventions may be employed to address symptoms associated with Autism Spectrum Disorder (ASD) that impede a child's successful integration into their family or school environment, particularly in cases when behavioral therapy proves ineffective. Furthermore, these devices can also be employed in the management of associated health concerns, such as Attention Deficit Hyperactivity Disorder (ADHD) or anxiety disorders. A majority of children in the United States who have been diagnosed with Autism Spectrum Disorder (ASD) are not provided psychoactive medicines or anticonvulsants. Among those who do receive such prescriptions, the most frequently prescribed pharmaceuticals are antidepressants, stimulants, and antipsychotics. The FDA has approved the use of Risperidone and Aripiprazole, which are classified as atypical antipsychotic medicines, for the treatment of aggressive and self-injurious behaviors that are associated with certain conditions [45,47,48]. However, their side effects must be weighed against their possible benefits,

and people with autism may react atypically [3]. Side effects, for example, may include weight gain, exhaustion, drooling, and aggression [3]. SSRI antidepressants are effective in reducing repetitive and ritualistic behaviors, whilst also methylphenidate is beneficial for those children with co-morbid inattentiveness or hyperactivity [49]. Limited empirical evidence exists about the effectiveness and safety of pharmacological interventions for individuals diagnosed with Autism Spectrum Disorder (ASD) during adolescence and adulthood. There is currently no pharmacological intervention that has been identified as effective in alleviating the core symptoms of autism, including those related to social and communication deficits. The symptoms associated with autism have been reversed or reduced in mice by the manipulation of gene function, as observed in experimental studies. These findings suggest the potential for the development of pharmaceutical interventions targeting specific uncommon mutations that are known to be causative factors in autism [49].

#### **Alternative medicine:**

Although there are various alternative treatments and tactics that exist, it is important to note that none of them have been supported by clinical trials. The efficacy of treatment procedures in quality-of-life contexts is constrained by a dearth of empirical evidence, while numerous services depend on performance metrics that suffer from deficiencies in statistical validity and real-world significance. Certain alternative therapies may provide a potential risk to the well-being of the child. The inclination of children diagnosed with autism spectrum disorder (ASD) towards consuming atypical food items may potentially lead to a decrease in the thickness of the cortical bone. This reduction is more pronounced in individuals adhering to casein-free diets, as these diets often result in insufficient intake of calcium and vitamin D. Nevertheless, inadequate bone development in individuals with ASD has also been associated with factors such as insufficient physical activity and gastrointestinal disorders. In 2005, a tragic incident occurred where a 5-year-old child with autism lost their life due to the unfortunate outcome of a chelation therapy procedure. The administration of chelation therapy is not advised for individuals with Autism Spectrum Disorder (ASD) due to the prevailing view that the potential hazards associated with this treatment exceed any potential benefits. CEASE therapy, an alternative medical approach that combines homeopathy, vitamins, and 'vaccine detoxification,' lacks empirical data to support its efficacy [50].

#### **Prognosis:**

There is currently no established remedy that has been scientifically validated. The severity of symptoms associated with Autism Spectrum Disorder (ASD) may diminish, occasionally resulting in the removal of the diagnosis. This phenomenon can occur following intensive intervention efforts, although it is not consistently observed. The extent of rehabilitation remains ambiguous, as various studies conducted by different researchers have shown rates ranging from 3% to 25%. The acquisition

of language in the majority of children with autism often occurs by the age of five or earlier, while a subset of individuals may develop communication abilities at later stages of development. Certain individuals diagnosed with autism spectrum disorder (ASD) may experience a deficit in social support, limited employment opportunities, and a reduced sense of self-determination. While core difficulties often exhibit long-lasting and persistent characteristics, it is worth noting that symptoms may exhibit a decrease in severity as individuals mature [25].

## **Conclusion**

Autism can be described as a spectrum of illnesses that exhibit variations in the intensity of symptoms, age at which they manifest, and association with other disorders such as intellectual disability, profound speech delay, and epilepsy. The presentation of symptoms associated with autism spectrum disorder exhibits significant variations across different developmental stages, encompassing infancy and adolescence. There is no one behavior that can be deemed universally indicative of autism, nor is there any activity that can definitively exclude a child from being diagnosed with autism. The diverse range of traits that are indicative of autistic spectrum disorders, such as deficits in social interaction, verbal and non-verbal communication, and limited patterns of interest or behavior, can be readily and consistently identified in early childhood by professionals who have received specialized training, including clinicians and educators. Nevertheless, the differentiation between classical autism and atypical autism, general developmental disorder-not otherwise specified (PDD-NOS), and Asperger's disorder can often be unclear and is commonly associated with the presence or severity of disabilities. Specialists who are educated in the treatment of young children with autism spectrum disorders can reliably diagnose these problems in 2-year-olds with adequate time and training. Efforts are currently being made to develop efficient identification tools for individuals in younger age groups. Early identification and diagnosis are crucial for children with autistic spectrum disorders, including those with vision or hearing impairments, as it enables them to acquire essential skills such as imitation and communication. This, in turn, allows them to derive maximum benefits from educational services. Moreover, there is evidence suggesting that initiating specific interventions for autistic spectrum disorders at an earlier stage is linked to a more favorable response to treatment.

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# A systematic review of interventions to improve medication adherence in family medicine patients

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## Abstract

**Background:** Medication non-adherence poses a significant challenge in healthcare, leading to suboptimal treatment outcomes. This systematic review aims to evaluate the effectiveness of different interventions in improving medication adherence.

**Methodology:** A comprehensive search was conducted to identify relevant studies. Inclusion criteria encompassed interventions targeting medication adherence and reporting quantitative measures of adherence outcomes. The selected studies were assessed for quality, and data were extracted for analysis.

**Results:** The review included a total of 14 studies. Interventions involving tailored phone calls or educational materials did not yield significant improvements in medication adherence. Conversely, interventions such as face-to-face counseling sessions and self-management programs showed promise in improving adherence. Nurse-led interventions and pharmacist-led consultations did not demonstrate significant improvements. Similarly, interventions involving stroke physician specialist assessments, behavioral feedback, medication reviews, and motivational interviewing did not yield significant improvements. A pooled analysis of various interventions across different healthcare settings showed a moderate but not statistically significant difference in medication adherence.

**Conclusion:** The findings from this systematic review suggest that interventions tailored to individual patient characteristics and involving personalized support and education show promise in improving medication adherence. However, interventions relying solely on tailored phone calls, educational materials, nurse-led care, pharmacist-led consultations, stroke physician specialist assessments, behavioral feedback, medication reviews, or motivational interviewing may not consistently improve adherence.

**Keywords:** Medication Adherence, Patient Compliance, Family Medicine, Education, Behavioral Modification.

## Introduction

Medication adherence, which is defined as the extent to which patients take their drugs as prescribed by medical practitioners [1–3], is a crucial aspect in achieving optimal health results. In numerous healthcare settings, including family medicine, poor adherence to prescription regimens is a prevalent and persistent problem [4–6]. Non-adherence to prescribed prescriptions poses major difficulties for patients, healthcare professionals, and healthcare systems, resulting in increased healthcare expenses, treatment failure, disease progression, and avoidable hospitalizations [7,8].

In family medicine, where primary care physicians play a crucial role in managing patients' overall health and wellbeing, medication adherence is of the utmost significance [9]. Medication adherence concerns can be effectively addressed in family medicine settings, which frequently serve as the patients' primary point of contact and offer complete and continuous care. In recognition of the importance of non-adherence on patient outcomes, several interventions have been designed and deployed to enhance drug adherence among family medicine patients [10,11].

This review seeks to provide an exhaustive evaluation of strategies targeted to improve drug adherence in family medicine settings. By carefully examining and integrating the existing evidence, this review tries to identify effective techniques and treatments that family medicine practitioners can apply to increase patient medication adherence.

This review is significant because it has the potential to inform clinical practice, policymaking, and future family medicine research endeavors. By finding effective interventions, healthcare professionals can integrate evidence-based practices into their everyday practice, resulting in improved patient outcomes. In addition, policymakers can use the findings of this analysis to develop and implement programs and policies that improve drug adherence in family medicine settings.

## Methodology

### 1. Study Design:

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparent reporting and rigorous methodology.

### 2. Search Strategy:

A comprehensive search was conducted to identify relevant studies. Electronic databases, including PubMed, Embase, Cochrane Library, Google Scholar, and websites were searched using a combination of relevant keywords and Medical Subject Heading (MeSH) terms including (Patient Compliance OR Medication Adherence) AND (Family Practice OR Primary Health Care) AND (Patient Education as Topic OR Reminder Systems OR Health Behavior OR Self Care OR Counseling OR Motivational Interviewing OR Health Knowledge, Attitudes, Practice OR Professional-Patient Relations OR Telemedicine OR Mobile Applications OR Medication Systems, Reminder OR Pharmaceutical Preparations/administration & dosage). The search strategy was developed in consultation with a medical librarian or information specialist to ensure accuracy and completeness.

### 3. Study Selection:

Two independent reviewers screened the retrieved articles for eligibility. Initially, titles and abstracts were screened based on predetermined inclusion and exclusion criteria. Full-text articles were obtained for potentially eligible studies. The reviewers assessed the full-text articles for final inclusion, resolving any discrepancies through discussion or consultation with a third reviewer, if necessary. The reasons for study exclusion were documented.

### 4. Inclusion and Exclusion Criteria:

#### ***The inclusion criteria for this review are as follows:***

- Interventions targeting medication adherence.
- Studies reporting quantitative or qualitative outcomes related to medication adherence rates or patient perceptions.
- Studies published in English.

#### ***The exclusion criteria are as follows:***

- Studies conducted in settings other than family medicine.
- Interventions not specifically targeting medication adherence.
- Studies not reporting outcomes related to medication adherence rates or patient perceptions.
- Studies not published in English.



## 5. Data Extraction:

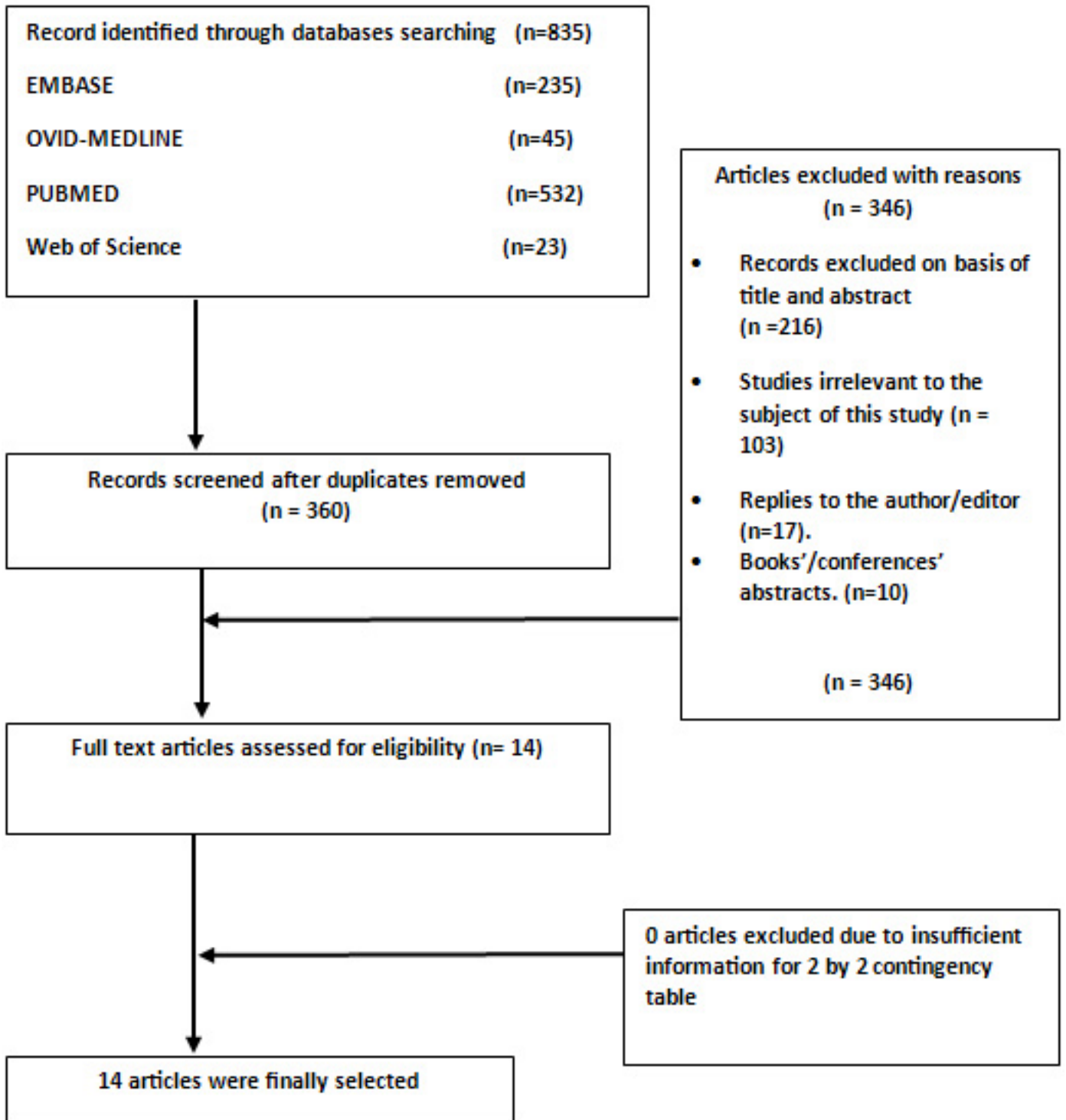
Data was extracted from the included studies using a standardized data extraction form. The extracted information included study characteristics (e.g., author, year of publication, study design), participant characteristics (e.g., sample size, demographic information), intervention details (e.g., type of intervention, duration, components), outcome measures (e.g., adherence rates, patient perceptions), and key findings. Data extraction was performed independently by two reviewers, with any discrepancies resolved through discussion or consultation with a third reviewer, if necessary.

## Results

The electronic search strategy conducted in this review ended in 835 hits which after removing duplications reduced to 360 studies. These 360 studies were considered eligible for further evaluation, from which 346 studies were excluded for different reasons as 216 studies were based on title and abstract, and 103 studies were not relevant to the subject of this study or sitting of this review, 17 were considered replies of authors, and there were 10 books. Finally, 14 articles were included in the qualitative synthesis of the present review (Figure 1).

The systematic review included a total of 14 studies that aimed to improve medication adherence in various populations and settings. The studies were conducted in different countries, including the USA, Canada, Turkey, China, Iran, the UK, and the Netherlands. The publication of the studies was during the last 20 years, ranging from 2003 to 2023. The study designs varied among the included studies, with randomized controlled trials being the most common design. Other designs included randomized clinical trials and parallel-group randomized controlled trials. The duration of follow-up ranged from 2 months to 12 months, with most studies having follow-up periods between 6 weeks and 6 months. The primary aim of the included studies was to evaluate the effectiveness of interventions in improving medication adherence or related outcomes. These interventions employed diverse approaches, such as behavioral interventions, patient-oriented education, in-home monitoring, supportive nursing interventions, motivational interviewing, nurse-led case management programs, self-management programs, pharmacist-led interventions, and technology-based interventions (telephone calls, text messages). The outcomes assessed in the studies included blood pressure control, medication adherence rates, self-efficacy, hospitalization rates, symptom improvement, and the impact on chronic conditions such as hypertension, diabetes mellitus, and schizophrenia.

Figure 1: The PRISMA figures showing the steps to choose the studies for systematic review



Interventions involving tailored phone calls or educational materials did not yield significant improvements in medication adherence. Friedberg et al. [12] conducted a study with 533 adults with hypertension, providing tailored monthly phone calls, but found no significant improvement compared to usual care. Similarly, Hamet et al. [13] provided educational material via mail to 4,864 adults with essential hypertension, but no significant improvement in medication adherence was observed.

In contrast, interventions that involved face-to-face counseling sessions or self-management programs showed promise in improving medication adherence. Ma et al. [16] conducted a study with 120 adults in community health centers, offering counseling sessions, and demonstrated a significant improvement in adherence. Hacıhasanoğlu et al. [14] implemented a comprehensive intervention with clinic and home visits, medication adherence education, and follow-up phone call interviews for 120 adults with hypertension, resulting in a significant improvement in medication adherence compared to baseline.

Nurse-led interventions, including supportive nursing care and nurse-led adherence support, did not show significant improvements in medication adherence. Kauric-Klein et al. [15] provided supportive nursing care to 118 adults receiving hemodialysis but did not find a significant improvement. Similarly, Schroeder et al. [20] conducted a study with 245 adults in general practices, offering nurse-led adherence support, but no significant improvement was observed.

Pharmacist-led interventions, such as patient-tailored consultations, did not yield significant improvements in medication adherence. van der Laan et al. [21] conducted a study with 170 adults in a community pharmacy, providing two consultation sessions with a pharmacist, but no significant improvement in adherence was found.

Interventions involving stroke physician specialist assessments, behavioral feedback, medication reviews, and motivational interviewing also did not demonstrate significant improvements in medication adherence. Mackenzie et al. [17] conducted a study with 56 adults in stroke prevention clinics, offering stroke physician specialist assessments and follow-up phone calls, but no significant improvement was observed. Ruppert et al. [19] provided behavioral feedback, counseling, and education to 33 adults in senior centers, but no significant improvement in adherence was found. Williams et al. [22] conducted a study with 80 adults in outpatient clinics, providing medication reviews and a DVD video, but no significant improvement in adherence was observed. Emile Barkhof et al. [23] and Beebe et al. [24] implemented motivational interviewing, telephone calls, and text messages in separate studies with adults in psychiatric clinics, but no significant improvements in medication adherence were reported.

Finally, a systematic review by Farmer et al. [25] examined various interventions, including in-person and telephone sessions, real-time medication monitoring dispensers, and web-based programs, involving 4,820 adults from different healthcare settings. The pooled analysis showed a moderate but not statistically significant difference in medication adherence between the intervention and control groups.

**Table 1: General characteristics of the included studies**

No.	Authors	Year of publication	Country	Design	Follow-up	Aim	Critical Appraisal
1	Friedberg [12]	2015	USA	Randomized Controlled Trial	6 months	Evaluation of the effectiveness of 2 behavioral interventions to improve BP control	The study was conducted among specific population (Urban Old veterans with hypertension)
2	Hamet [13]	2003	Canada	Randomized clinical trail	12 months	To improve medication adherence in patients with essential hypertension by modifying their behaviors	Moderate risk for selection bias in the nature of enrolment
3	Hacihanoglu [14]	2011	Turkey	Randomised controlled study	6 months	Determine the effect of anti-hypertensive patient-oriented education and in-home monitoring for medication adherence and management of hypertension	No risk for bias
4	Kauric-Klein [15]	2011	USA	Randomised controlled study	12 weeks	examined whether a supportive nursing intervention incorporating monitoring, goal setting, and reinforcement can improve blood pressure (BP) control in a chronic HD population	The study depended on small sample size
5	Ma [16]	2014	China	Randomised controlled study	24 weeks	This study tests the effectiveness of motivational interviewing compared with the usual care for Chinese hypertensive patients.	The study depended on small sample size
6	Mackenzie [17]	2013	Canada	Randomized controlled study	6 months	Evaluated whether a model of nurse-led case management program would improve BP measures and adherence to medications.	The study depended on small sample size
7	Moradi [18]	2019	Iran	Randomized controlled trial	12 weeks	Evaluate the effects of a self-management program based on the 5 A's model on self-efficacy among the older men with hypertension.	The study depended on small sample size
8	Ruppar [19]	2010	USA	Randomized controlled study	20 weeks	Test of a novel 8-week behavioral feedback intervention to improve antihypertensive medication adherence (MA) and BP control among older adults	The study depended on small sample size
9	Schroeder [20]	2005	UK	Randomized controlled	2	To evaluate the effect of nurse-led adherence support for people with uncontrolled high	Low risk of bias

					study	months	blood pressure compared with usual care.
<b>10</b>	van der Laan [24]	2018	Netherlands	Parallel-group randomized controlled trial	3 months	investigate the effectiveness of a patient-tailored, pharmacist-led and theory-driven intervention program aimed to enhance self-reported adherence to antihypertensive medication	Moderate bias of selection of patients
<b>11</b>	Williams [22]	2012	Australia	Randomized controlled trial.	12 weeks	Test the feasibility and impact of an intervention consisting of self-monitored blood pressure, medicine review, a Digital Versatile Disc, and motivational interviewing telephone calls to help people with diabetes and kidney disease improve their blood pressure control and adherence to prescribed medications.	Small sample size.
<b>12</b>	Emile Barkhof [23]	2013	Netherlands	Randomized controlled study	6 and 12 months	Determine the effectiveness of a MI intervention on adherence and hospitalization rates in patients, with multi-episode schizophrenia or schizoaffective disorder	Subgroups were relatively small and patients were not randomized on these characteristics.
<b>13</b>	Beebe [24]	2014	USA	Randomized controlled study	9 months	The study compared the effect of telephone calls only, text messages only, and both telephone calls and text messages on individuals' symptoms and medication adherence.	Small sample size
<b>14</b>	Farmer [22]	2016	UK	Systematic review	6-12 months	To assess the impact of interventions promoting the monitoring of medication use and brief messaging to support medication adherence in patients with Type 2 diabetes mellitus.	There is risk of bias in the findings of the majority of trials included in this systematic review

**Table 2: The summary of the intervention used in the studies and its outcomes**

First author [Ref]	Subjects/setting	Intervention/s modality and strategy	Control care	Interventionist profession	Measured constructs	Method of measuring adherence	Improvement in medication adherence
<b>Friedberg [12]</b>	533 adults in Veterans Affairs medical center clinics with hypertension	Patients received tailored monthly phone call	UC	Psychology counselors or social work		MMAS	Not sig. improvement ( $p = .306$ )
<b>Hamet [13]</b>	4,864 adults with essential hypertension from general practice setting	Patients received educational material at 1, 2, 3, 4, 6, and 12 months via mail	UC	Nurses		Discontinuation rate	Not sig. improvement ( $p = .94$ )
<b>Hacihasanoglu [14]</b>	120 adults in public primary health care facilities and homes with hypertension	A: four clinic visits, two home visits and medication adherence education, follow-up phone call interviews B: four clinic visits, two home visits and healthy lifestyle education, follow-up phone call interviews	UC	Nurses		MAES	Sig. improvement (A&B: $p < .0001$ ) compared to baseline
<b>Kauric-Klein [15]</b>	118 adults in hemodialysis center with hypertension	Two education sessions, weekly individual meeting	UC	Nurses	Self-efficacy	MMAS	Not sig. improvement ( $p = .30$ )
<b>Ma [16]</b>	120 adults in community health centers with hypertension	Counseling session/face to face	UC	Nurses	Self-efficacy	TAQPH	Sig. improvement ( $p = .039$ )
<b>Mackenzie [17]</b>	56 adults in stroke prevention clinics	Stroke physician specialist assessment, monthly follow-up phone call	UC	Physicians and Nurses	Self-efficacy	Self-report of number of missed pills, review of prescription renewal patterns	Not sig. improvement ( $p = .2$ )
<b>Moradi [18]</b>	60 adults outpatient clinic with hypertension	Face-to-face meeting every 12 weeks, 1 hr training session with family members, daily phone call for the first 2 weeks and, then, weekly	UC	Nurses		Steinberg's Hypertension Self-Efficacy Scale	Not sig. improvement ( $p = .07$ )

<b>Ruppar [19]</b>	33 adults in senior centers with hypertension	Biweekly feedback, habit counseling, medication and disease education, a medication instruction card	UC	Nurse		Electronic medication bottle cap with a digital display	Not sig. improvement ( $p = .2$ )
<b>Schroeder [20]</b>	245 adults, general practices with hypertension	One adherence support face-to-face session and one reinforcement session	UC	Nurse		MEMS cap	Not sig. improvement ( $p = .76$ )
<b>van der Laan [21]</b>	170 adults in community pharmacy with hypertension	Two consultation sessions face to face	UC	Pharmacists	Belief, Illness Perception	Horne's MARS-5	Not sig. improvement ( $p = .18$ )
<b>Williams [22]</b>	80 adults, outpatients' clinics with hypertension	Medication review, 20 min DVD video via telephone	UC	Nurses		MMAS	Not sig. improvement ( $p = .16$ )
<b>Emile Barkhof [23]</b>	114 adults in psychiatric clinic	Motivational interviewing ( $n = 55$ )	UC (Health education)	Nurses		Medication Adherence Questionnaire for Schizophrenia or Bipolar Disorders	No significant differences between motivational interviewing and health education on 6- and 12-month follow-up ( $p = 0.34$ ).
<b>Beebe [24]</b>	30 adults in psychiatric clinic	Telephone call ( $n = 10$ ) SMS ( $n = 10$ ) Telephone + SMS ( $n = 10$ )		Nurses		Pill counts for Schizophrenia or Bipolar Disorders	No significant difference in adherence was noted between the groups on the basis of pill counts ( $p = 0.31$ ).
<b>Farmer [25]</b>	4820 adults who presented at pharmacies, primary care.	Patients had in-person and telephone sessions, Real-time medication monitoring dispenser, web-based programme in which participants	UC	Nurses, pharmacist		MMAS, Questionnaire, Medication Event Monitoring System, self-report	The pooled difference in medication adherence between intervention and control was moderate and not statistically significant [standardized mean difference = 0.22 (95% CI -0.05; 0.49)].

## Discussion

Adherence to medication regimens is crucial to the successful management of a variety of medical illnesses [26–28]. Many patients, however, struggle to adhere to their recommended pharmaceutical regimens, resulting in unsatisfactory treatment outcomes [29,30]. This systematic study sought to assess the efficacy of several approaches for enhancing medication adherence. The included studies employed a variety of strategies, and their results were highly variable.

Several approaches, including individualized phone calls and educational materials, did not significantly increase medication adherence. Friedberg et al. [12] and Hamet et al. [13] both implemented programs aimed at individuals with hypertension; however, neither intervention demonstrated a substantial improvement in adherence. These findings are consistent with several studies including two systematic reviews which showed that the use of electronic communication and technology showed limited evidence to be effective in increasing the adherence rate to medications [31,32]. These findings suggest that providing targeted information or reminders may not be adequate to address the complex causes behind non-adherence to medicine.

Conversely, therapies incorporating in-person counseling sessions or self-management programs demonstrated more promising outcomes. Ma et al. [16] developed counseling sessions for adults at community health clinics, resulting in a significant improvement in medication adherence in comparison to standard care. Similarly, Hacıhasanolu et al. [14] performed a comprehensive intervention consisting of clinic and home visits, education, and follow-up interviews, which resulted in a substantial improvement in adherence among individuals with hypertension. In a previous systematic review, the authors found that 6 out of 17 studies that used telemedicine showed a significant improvement in the medication adherence and all interventions which had a statistically significant positive effect on medication adherence involved personal contacts between therapists and patients [33]. Moreover, multiple studies have demonstrated that provider-guided therapies are more successful than self-guided ones [34–39]. Additionally, provider-led interventions are more durable [35]. There appears to be no difference in effectiveness between interventions led by nurses and those led by pharmacists [38]. Additionally, several studies on the efficacy of eHealth interventions have indicated that personal contact with a healthcare professional or non-professional can promote drug adherence [40,41]. Patients are afraid, for instance, that without personal interaction, advice may be provided incorrectly or that they may lose motivation for the intervention [42]. Choi demonstrated that informal social support and eHealth can promote healthy behaviors in tandem [43]. Additionally, virtual group therapy appears to have similar outcomes as in-person group therapy [44–46]. These results demonstrate the significance of tailored support and education in encouraging drug adherence. Medication adherence was not significantly improved

by interventions led by nurses, including supportive nursing care and nurse-led adherence support. Adults on hemodialysis were provided nursing care by Kauric-Klein et al. [15], although adherence did not improve appreciably. Similarly, Schroeder et al. [20] conducted a trial in general practices in which nurse-led adherence support was provided, but no substantial improvement was reported. These findings imply that although nurses play a vital role in patient care, other methods may be required to effectively manage pharmaceutical non-adherence.

Medication adherence was not significantly improved by interventions comprising stroke physician specialized assessments, behavioral feedback, medication reviews, and motivational interviewing. Mackenzie et al. [17] used stroke physician specialized exams and follow-up phone calls for people in clinics for stroke prevention without seeing a substantial improvement. Adults at senior centers received behavioral feedback, counseling, and education from Ruppert et al. [19], but there was no substantial increase in adherence. Williams et al. [22] conducted medication reviews and distributed DVD videos to adults in outpatient clinics, but there was no substantial improvement in adherence. In separate investigations with adults in psychiatric clinics, Emile Barkhof et al. [23] and Beebe et al. [24] employed motivational interviewing, telephone calls, and text messages, but no substantial increases in medication adherence were reported. These findings imply that these interventions may not be sufficient on their own and may need to be incorporated into more extensive adherence support programs [47,48].

A systematic review by Farmer et al. [25] investigated a variety of interventions, such as in-person and telephone sessions, real-time medication monitoring dispensers, and web-based programs, in various healthcare settings. The pooled analysis revealed a considerable but not statistically significant difference between the intervention and control groups in terms of medication adherence. In spite of the fact that these interventions may have some good influence on adherence, their overall effectiveness remains unclear, and additional research is required.

Variability in the efficacy of therapies to enhance medication adherence demonstrates the complexity of non-adherence and the need for individualized approaches. Importantly, medication non-adherence is influenced by a variety of factors, including patient views and attitudes, socioeconomic factors, healthcare system limitations, and drug-related problems [49,50]. Comprehensively addressing these variables may necessitate interventions that integrate educational, psychological, and behavioral measures.

Future research should focus on the development and evaluation of therapies that address the unique requirements and problems of various patient populations and healthcare settings. Adapting interventions to specific patient characteristics, such as socioeconomic position, health literacy, and cultural background, may be essential for increasing drug adherence. In addition, interventions



In addition, interventions involving teamwork across healthcare practitioners, such as pharmacists, nurses, and physicians, may have a higher likelihood of success.

In conclusion, improving drug adherence continues to be a key concern in healthcare. Some therapies, such as face-to-face counseling and self-management programs, have shown promise in enhancing adherence, but others, such as personalized phone calls and educational materials, have generated limited or no meaningful gains. Several factors appear to influence the efficacy of interventions, including the individual patient group, the intervention's complexity, and the healthcare system. To discover the most effective techniques for promoting drug adherence and to design therapies that address the varied character of non-adherence, additional research is required. Healthcare professionals can improve patient outcomes and optimize the management of chronic illnesses by employing individualized and comprehensive strategies.

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# Neonatal Tetanus: case report in Saudi Arabia

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## Abstract

**Aims:** This paper aims to investigate a case of neonatal tetanus in Saudi Arabia, studying the different factors leading to infection, role and protocols used in hospital in diagnosis and management of the case.

**Methods:** A medical profile of neonatal case confirmed for neonatal tetanus was collected and studied, in addition to collecting literature reviews about epidemiology, diagnosis and management.

**Results:** A newborn 7-day old girl with poor socioeconomical status and poor aseptic delivery had been admitted to hospital with symptoms of jerky repetitive movement and history of decreased feeding and poor sucking for one day. Laboratory tests, cranial computed tomography (CT) and lumbar puncture were performed, all of them with normal results. She was hospitalized on 12 November, 2019 in an environment free of sensorial stimuli in the Pediatric Intensive Care Unit (PICU), with assisted ventilation. The patient was treated with metronidazole 30mg/kg/day, ampicillin 150 mg/kg/day, and cefotaxime 150mg/kg/day.

Sedation was maintained with midazolam 6mic/kg/min. Also, we started on muscle relaxation pancuronium 0.1 mg /kg/hr. and Magnesium sulfate. Besides that, we administered human immunoglobulin IM (500 IU), as well as one dose of tetanus toxoid. During hospital admission the condition of the patient was much improved. On 19 December 2019 the patient was extubated and started with baclofen and physiotherapy.

**Conclusion:** This case indicates that non-sterile delivery by non-practical attendants are the biggest cause of neonatal tetanus along with mothers unimmunized against tetanus. However, in the rarest of incidence of neonatal tetanus, physicians should be prepared to suspect, diagnose and treat neonatal tetanus and ensure clear and clean delivery of newborns. A combination of antibiotics and muscular relaxants are used to manage neonatal tetanus.

**Key words:** neonatal tetanus, case report, Saudi Arabia

## Introduction

One of the concerns of current global public health policies is to eliminate neonatal tetanus and while in the last two decades, much progress has been made trying to reduce the global incidence of

neonatal tetanus, neonatal tetanus remains a leading cause of neonatal mortalities in some countries [1,2]. Neonatal tetanus is considered a medical emergency with high mortality which may reach 100 % without medical care and more than 50 % with hospital care [3,4] and it causes 7 % of total neonatal deaths [1].

According to many organizations such as the World Health Organization, United Nations Children's Fund (UNICEF) and The United Nations Population Fund (UNFPA), worldwide

incidence of neonatal tetanus has reduced significantly. In 2014, only 24 countries out of 59 originally targeted were still to eliminate the disease [5]. In the Eastern Mediterranean region 181 cases were confirmed with neonatal tetanus in 2018 compared with 557 in 2017 and 1130 cases in the Africa region in 2018 [6]. In Saudi Arabia, only 4 cases were officially reported for neonatal tetanus in 2018 compared with 37 cases in 2014 [7].

*Clostridium tetani* is the pathogen whose toxin causes the generalized tetanus of neonatal tetanus. The gram-positive spore-forming anaerobes whose spores can survive in soil and in the gastrointestinal tracts of animals (including human beings), and can contaminate many surfaces and substances and remains for decades, causes infection by contamination of wounds [8–11]. In neonatal cases, the main access of pathogen is contamination of umbilical stump at birth or during the first days of life with the clinical status appearing within 14 days after birth considering that the shorter the incubation period, the more serious the disease will be [12,13]. After contamination, tetanus toxin enters into central nervous system causing muscle spasm, interfering with the ability of sucking and feeding and later causing chest muscle spasm, lowering respiration and without emergency medical treatment, it may cause death of the baby [14,15].

According to WHO, only children with a history of the next three elements together are considered confirmed cases of neonatal tetanus. The first element is normal feeding and crying during the first 2 days of life. Onset of illness between age 3 to 28 days from birth and inability to suckle (trismus) followed by stiffness (generalized muscle rigidity) and/or convulsions (muscle spasms) [1]. It is a clinical diagnosis with no available laboratory investigation to confirm it [11,16].

The prevention of neonatal tetanus is easily applicable through immunization of pregnant women against tetanus where the born child will also be immune against the disease for their first months of life. In addition to increase hygienic birth practice to ensure the prevention of infection

of newborn during the birth process and proper cord care to ensure low risk of contamination [5].

Treatment of neonatal tetanus is based on proper cleaning of wounds and usage of antibiotics to eradicate the pathogens. Besides, tetanus antitoxin is given to the baby to inactivate any free tetanus toxin [17,18]. Treatment of the muscular rigidity and spasms in tetanus is of vital importance, since this feature of the disease often interferes with respiration and is a likely cause of death [19].

In this report, we show a neonatal case delivered to hospital showing the medical diagnosis and treatment.

## Case Report

A 7 day old baby girl with a low socioeconomic status; home delivery, the umbilical cord had been cut with scissors under aseptic technique. She presented to the emergency department with jerky repetitive movement and history of decreased feeding and poor sucking for one day. On physical examination patients have generalized recurrent spasms which are clenched fists with flex and abduct their arms while extending their legs. Also, the neonate has muscular stiffness in the jaw. On the 2nd day of admission, patients started to have generalized abdominal muscle contraction.

Laboratory tests, cranial computed tomography (CT) and lumbar puncture were performed, all of them with normal results.

Hemoglobin 12.9 g/dl Leucocytes 13.01 \*10<sup>3</sup>/ul, Neutrophils 8.46 \*10<sup>3</sup> /ul, Lymphocytes 3.01 \*10<sup>3</sup>/ul, Platelets 309.50\*10<sup>3</sup>/ul, Glucose 5 mmol/l, Urea 1.5 mmol/l, Creatinine 47.60 umol/L, ALT 21 U/L AST 58U/L, Calcium 2.18 mmol/L, Sodium 150 mmol/L, Potassium 3.8 mmol/L.

She was hospitalized on 12 November 2019 in an environment free of sensorial stimuli in the Pediatric Intensive Care Unit (PICU), with assisted ventilation, parenteral hydration, and nutrition through nasogastric tube.

The patient was treated with metronidazole 30mg/kg/day, ampicillin 150 mg/kg/day, and cefotaxime 150mg/kg/day . Sedation was maintained with midazolam 6mic/kg/min. Also, we started her on muscle relaxation pancuronium 0.1 mg /kg/hr. and Magnesium sulfate. Besides that, we administered human immunoglobulin IM (500 IU), as well as one dose of tetanus toxoid.

During hospital admission the condition of the patient was much improved. On 19 December 2019, the patient was extubated and started with baclofen and physiotherapy.

## Discussion

Approximately 515,000 neonatal deaths were attributed to tetanus worldwide in 1993 [20]. The World Health Organization [21] aimed to achieve worldwide neonatal tetanus elimination by 2005, which was defined as the reduction of neonatal tetanus cases to less than 1 case per 1,000 live births in every district of every country. In 2000, neonatal tetanus was still not eliminated in 57 countries, including Vietnam and China.

Poor socioeconomic status in some rural populations is associated with low immunization coverage, high incidence of delivery by untrained traditional birth attendants and inappropriate cord care as we saw in this case, which is considered higher risk for developing neonatal tetanus [11]. The failure of the mother in this case to have total care during delivery can be explained by poor socioeconomic status and low awareness of the importance of hospital delivery and immunization of her and her baby. Non-sterile delivery practice by unpractical or traditional attendant (daia) as shown in this case is the most contributing factor to neonatal tetanus in developing countries [22]. WHO supports the use of six clean measures to improve the hygiene of delivery including clean birth surface, clean hands, clean perineum, cord cutting, cord tying, and cord care [23]. Another study showed that clean birth practice at home could prevent 30 % of neonatal tetanus deaths, increased to 35 % in the presence of skilled attendants and 40 % if birth took place in a health-care facility with postnatal measures [24,25].

Clinical diagnosis is the principal diagnosis of neonatal tetanus including inability of the newborn to suckle, spasm, stiffness and convulsion beginning with trismus or 'locked jaw' due to spasms of the masseter. Then, rigidity spreads down the arms and trunks over the next 1 to 2 days of infection. However, these clinical manifestations may be confused with seizures and can only be differentiated from tetanus as consciousness is maintained with tetanus. In addition, similar symptoms are shown with meningitis, hypocalcemia and hypoglycemia. Therefore, CT and lumbar puncture besides blood analysis can be done and the results eliminate these reasons [20].

Management of tetanus depends on different factors including sedation and control of spasms of muscle, neutralization of tetanus toxin, getting rid of *Clostridium tetani* using antibiotic in order to prevent further production of toxin along with wound debridement, manage complications including autonomic dysfunction and supportive care [21]. To prevent local proliferation of *C. tetani* at the wound site, antibiotics are administered to patients with tetanus including penicillin G, metronidazole and doxycycline [26] e.g., with intravenous metronidazole, 500 mg three times daily, or penicillin, 100,000–200,000 IU/kg/day. In this case, a combination of metronidazole/ampicillin and cefotaxime was given to the patient.

The 'routine' practice in managing patients with tetanus includes heavy sedation and paralysis with neuromuscular blockade by muscle relaxants supported by artificial ventilation [27]. Benzodiazepines midazolam and diazepam and anesthetic agents such as propofol are used as sedatives [28,29].

Benzodiazepines [30], which enhance the effect of GABA on the GABA A receptors of lower motor neurons and causes combination of muscle relaxant, anticonvulsant, sedative and anxiolytic effects. Okoromah and Lesi proved that using diazepam was related with better survival rate in children when compared to a combination of phenobarbitone and chlorpromazine (relative risk for death 0.36, 95% confidence interval 0.15 to 0.86: risk difference -0.22, 95% confidence interval -0.38 to -0.06). Another GABA-A receptor modulator, may be used [31], as may non-depolarizing muscle relaxants (pancuronium, pipecuronium) [32]. These relaxants act by competing for the acetylcholine binding site directly on the muscle motor end plates. In addition, magnesium which is a calcium antagonist and has dual action by reducing acetylcholine release in addition to reduce the muscle response to acetylcholine [33–35], may be effective in relieving rigidity and spasms [36]. Magnesium also seems to reduce autonomic dysfunction [37]. In this case, management of convulsion had been managed by using a combination of midazolam/ pancuronium and Magnesium sulfate.

Tetanus patients should be in a calm environment to avoid the developing of spasms

by noise or other sensory stimulation. This objective must be balanced against the need to avoid sensory deprivation, which predisposes to delirium, a condition that tetanus patients are prone to, given their often-lengthy stays in intensive care units with mechanical ventilation and treatment with neuroactive drugs such as benzodiazepines and propofol [38].

Prophylaxis against tetanus consists of immunization with tetanus toxin (toxoid) and measures to achieve good hygiene of delivery. For example, contamination of the umbilical stump of the newborn is a primary cause of neonatal tetanus. These issues are preventable with a good immunization status in pregnant women leading to reduction in the prevalence of neonatal tetanus [39], because maternal anti-tetanus toxin antibodies are transferred across the placenta to the child [32].

Finally, in conclusion this case indicates that non-sterile delivery by non-practical attendants are the biggest cause of neonatal tetanus along with mothers un-immunized against tetanus.

However, in the rarest of incidence of neonatal tetanus, physicians should be prepared to suspect, diagnose and treat neonatal tetanus and ensure clear and clean delivery of newborns. A combination of antibiotics and muscular relaxants are used to manage neonatal tetanus.

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