

Awareness and Knowledge about Childhood Autism among Family Medicine Residents in Al Madinah Region in Saudi Arabia, 2020

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Abstract

Background: Autism spectrum disorder (ASD) refers to a range of conditions characterized by some degree of impaired social behavior, communication and language, and a narrow range of interests and activities that are both unique to the individual and carried out repetitively.

Objective: To assess knowledge of Family Medicine residents in Al Madinah Region regarding childhood autism.

Methods: This cross-sectional study was conducted to assess knowledge of 103 family medicine residents about childhood autism in Al Madinah Region, Saudi Arabia. A structured self-administered web-based Healthcare Workers (KCAHW) Questionnaire was used to assess knowledge of childhood autism among participant residents.

Results: Residents' total score (Mean±SD) was 13.18±2.80 (out of 19, 69.4%). The highest attained mean scores were for the first and second domains (6.36±1.64, 79.5% and 0.78±0.42, 78%, respectively), while the lowest was for the fourth domain (2.62±1.10, out of 6, 43.7%). Highest mean knowledge scores among participants were among those aged 35-39 years (13.33±0.58). However, knowledge scores did not differ significantly according to residents' age groups. Male residents had significantly lower knowledge scores than females (12.56±2.53 and 14.21±2.95, respectively, p=0.003). Mean

knowledge scores were highest among R4 residents (13.66±2.91). However, knowledge scores did not differ significantly according to residents' training levels. Participants in Yanbu Residency Program had significantly lower mean knowledge scores than those in AL Madinah (12.26±2.70 and 13.45±2.79, respectively). However, knowledge scores did not differ significantly according to residency programs. Mean knowledge scores about autism did not differ significantly according to attending workshops or conferences about autism.

Conclusion: Knowledge of family medicine residents regarding childhood autism is suboptimal. Correlates of KCA may help in selection of healthcare workers who would best provide health education and management for caregivers of children with autism. It is important to update the knowledge gaps of healthcare workers who have limited knowledge regarding childhood autism and to train them to be able to provide healthcare service that would ensure early diagnosis and interventions for management of autism.

Key words: Autism spectrum disorder, children, Family Medicine, Knowledge, Saudi Arabia.

Introduction

Autism spectrum disorder (ASD) refers to a range of conditions characterized by some degree of impaired social behavior, communication and language, and a narrow range of interests and activities that are both unique to the individual and carried out repetitively. ASDs begin in childhood and tend to persist into adolescence and adulthood. In most cases the conditions are apparent during the first five years of life. Individuals with ASD often present with other conditions, including epilepsy, depression, anxiety and attention deficit hyperactivity disorder. The level of intellectual functioning in individuals with ASDs is extremely variable, extending from profound impairment to superior levels [1].

ASD can sometimes be detected at 18 months or younger. By the age of two years, a diagnosis by an experienced professional can be considered very reliable. However, many children do not receive a final diagnosis until much older [2]. Not all causes of ASD are known. However, we have learned that there are likely many causes for multiple types of ASD. There may be many different factors that make a child more likely to have an ASD, including environmental, biologic and genetic factors. Most scientists agree that genes are one of the risk factors that can make a person more likely to develop ASD [3]. Children who have a sibling with ASD are at a higher risk of also having ASD [4-5].

ASD continues to be an important public health concern as its prevalence has increased over time. A global estimation shows that 1 in 160 children have ASD with increased occurrences in boys [1] and has increased now to be between 0.9% to 1.5% among children [7]. A study was done recently in the Gulf region that reported the prevalence was the highest in the Kingdom of Saudi Arabia (KSA), with 59 per 10,000 children [8]. For that high prevalence globally and locally and because there is no medical test, like a blood test to diagnose ASD, doctors need to look at the child's behavior and development to make a diagnosis.

Since the Family Medicine physicians are the first contact of the families within the healthcare system it is important that Family Medicine physicians have knowledge of autism in order to offer families appropriate guidance and support. One study was done in Riyadh city, KSA among Family Physicians Medicine and published in June 2019 shows low awareness level and moderate to low level of confidence in the physician's ability to recognize, identify, or communicate in regard to ASD [9].

Therefore, this study is possibly the first study that investigates the awareness and knowledge of ASD among family medicine residents in Saudi Arabia.

Aim of study

To assess knowledge of Family Medicine residents in Al Madinah Region regarding childhood autism.

Methodology

Study design

This study followed a cross-sectional design, using a self-administered questionnaire which was carried out at the Family Medicine training centers in Al Madinah region in Saudi Arabia.

Population and Setting

This study was conducted with Family Medicine residents in the Al Madinah region, which lie in the Western Province of Saudi Arabia. The total number of Family medicine residents in this region is 161.

Sample Size and Sampling Procedure

The sample size was based on the total number of Family Medicine residents (N=161) and was determined using the Raosoft sample size online calculator [10], with a predetermined margin of error of 5% and a confidence level of 95%. The target sample size was set at 109 residents. Of those, 103 responded to the survey, giving a response rate of 64%.

A non-probability purposive sampling method was used. The inclusion criteria were as follows: being a family medicine resident (R1 to R4), and being trained in a family medicine center in Al Madinah region, and being a Saudi national. The exclusion criteria were as follows: Family medicine residents in regions other than Al Madinah, Family Medicine specialists or consultants, and non-Saudi nationals.

Data collection

Data were collected using the English version of the "Knowledge about Childhood Autism among Healthcare Workers (KCAHW)" Questionnaire [11]. The questionnaire was adapted from a previous study and was modified to include the gender, level of residency, residency program city, and any attended ASD workshops or conferences. The questionnaire form was self-administered and web-based. The questionnaire consisted of demographics/background information and four domains to assess knowledge related to ASD. The questionnaire included demographic variables of participants, such as gender, residency level, Program city, and workshops or conference attendance about ASD.

The first domain contains eight-item questions that addressed the impairments in social interaction usually found in children with childhood autism. The scores in this domain range from 0 to 8. The second domain contains only one-item question that addressed impairment in area of communication and language development, which is a part of symptom presentation in children with childhood autism. The scores in this domain range from 0 to 1. The third domain contains four-item questions that addressed the areas of obsession and compulsive pattern of behavior found in children with childhood autism; a pattern of behavior which had been described as restricted, repetitive and stereotyped. The scores in this domain range from 0 to 4. The last domain contains six-item questions

that addressed information on what type of disorder is childhood autism, possible comorbid conditions and onset of childhood autism in affected children. The scores in this domain range from 0 to 6 [11].

Therefore, the total scores range from 0 to 19 for the four-domain scores added together. The mean total score for the KCAHW questionnaire among a particular sample population or community is a measure of the knowledge level about childhood autism among that particular population [11].

After obtaining ethical approval, a pilot study was conducted using the study questionnaire with eight family medicine residents to determine the clarity of the language and the questionnaire's structure. The results of the pilot study were not included in the main results. Then, copies of the study questionnaire were delivered to family medicine residents during the period from September to October 2021.

Data entry and analysis

The collected data was cleared, entered, and analyzed by using the Statistical Package for Social Sciences (IBM, SPSS version 25.0 for windows). Descriptive analysis methods were used, and data were presented in terms of frequencies and percentages for qualitative data and mean \pm SD for quantitative data. To test significance of differences in knowledge scores, independent variable t-test and analysis of variance (ANOVA) were applied accordingly. P-values less than 0.05 were considered as statistically significant.

Ethical consideration

An ethical clearance was given by the Ethical Committee of the Ministry of Health in Al Madinah region. All respondents were asked for their consent before participation in the study.

Results

Table 1 shows that 103 residents completed and submitted the online "Knowledge about Childhood Autism among Healthcare Workers (KCAHW) Questionnaire". The data in table 1 shows that (73.8%) of the responses were from the residents whose age 26-30 years old. About two-thirds of participants (62.1%) were males. The highest responses were from fourth level residents, while the lowest were from the third level residents (31.1% and 19.4%, respectively). About three-quarters of responses were from AL Madinah residents (77.7%). Only 18.4% of the residents attended workshops or conference about autism.

Table 2 describes residents' responses regarding the eight statements included in the first domain, addressing the impairments in social interactions usually found in children with childhood autism. The majority of residents gave correct answers about marked impairment in use of multiple non-verbal behaviors (90.3%), failure to develop peer relationship (89.3%), and social smile is usually absent (81.6%), lack of spontaneous will to share enjoyment (86.4%), and lack of social or emotional reciprocity

(81.6%). More than two-thirds of participants gave correct answers regarding loss of interest in the environment and surroundings (71.8%) and the fact that the child can appear as if deaf or dumb (68.9%), while the residents got the lowest score regarding the statement staring into open space and not focusing on anything specific (55.3%).

Table 3 includes the first domain (only one statement) that addressed impairment in area of communication and language development, which is part of symptom presentation in children with childhood autism. Most residents (77.7%) gave the correct answer.

Table 4 includes the third domain (4 statements) assessing obsession and compulsive pattern of behavior found in children with childhood autism; a pattern of behavior, which had been described as restricted, repetitive and stereotyped. More than three-quarters of participants gave correct answers regarding hand repetitive movement, persistent preoccupation with parts of objects and love for regimented routine activities (81.6%, 77.7%, and 76.7%, respectively), while 41.7% gave a correct answer regarding the fact that autism may be associated with abnormal eating habits.

Table 5 included the fourth domain, which contained six statements that addressed the information nature of childhood autism, possible comorbid conditions, and onset of childhood autism in affected children. More than three-quarters of participants had correct answers regarding what type of disorder is childhood autism, which was represented by these two statements; autism is childhood schizophrenia and autism is an auto-immune condition (76.7% and 77.6%, respectively), while less than half of participants gave wrong answers regarding comorbid conditions associated with autism. Regarding the onset of childhood autism, 65% gave the correct answer, as shown in Table 6.

Table 7 shows that residents' total score (Mean \pm SD) was 13.18 \pm 2.80 (out of 19, 69.4%). The highest attained mean scores were for the first and second domains (6.36 \pm 1.64, 79.5% and 0.78 \pm 0.42, 78%, respectively), while the lowest was for the fourth domain (2.62 \pm 1.10, out of 6, 43.7%).

Table 8 shows that highest mean knowledge scores among participants were among those aged 35-39 years (13.33 \pm 0.58). However, knowledge scores did not differ significantly according to residents' age groups. Male residents had significantly lower knowledge scores than females (12.56 \pm 2.53 and 14.21 \pm 2.95, respectively, $p=0.003$). Mean knowledge scores were highest among R4 residents (13.66 \pm 2.91). However, knowledge scores did not differ significantly according to residents' training levels. Participants in Yanbu Residency Program had significantly lower mean knowledge scores than those in AL Madinah (12.26 \pm 2.70 and 13.45 \pm 2.79, respectively). However, knowledge scores did not differ significantly according to residency programs. Mean knowledge scores about autism did not differ significantly according to attending workshops or conferences about autism.

Table 1: Demographics/ background

Personal Characteristics	No.	%
Age groups (in years)		
• 26-30	76	73.8
• 31-34	24	23.3
• 35-39	3	2.9
Gender		
• Male	64	62.1
• Female	39	37.9
Level of training		
• R1	24	23.3
• R2	27	26.2
• R3	20	19.4
• R4	32	31.1
Residency program		
• Yanbu	23	22.3
• AL Madinah	80	77.7
Attending any workshops or conference about autism		
• Yes	19	18.4
• No	84	81.6

Table 2: Residents' responses regarding the first domain (impairments in social interaction)

Statements	Yes	No	Do not know
	No. (%)	No. (%)	No. (%)
Marked impairment in use of multiple non-verbal behaviors	93 (90.3)	4 (3.9)	6 (5.8)
Failure to develop peer relationship appropriate for developmental age	92 (89.3)	2 (1.9)	9 (8.7)
Lack of spontaneous will to share enjoyment, interest or activities with other people	89 (86.4)	7 (6.8)	7 (6.8)
Lack of social or emotional reciprocity	84 (81.6)	5 (4.9)	14 (13.6)
Staring into open space and not focusing on anything specific	57 (55.3)	22 (21.4)	24 (23.3)
The child can appear as if deaf or dumb	71 (68.9)	16 (15.5)	16 (15.5)
Loss of interest in the environment and surroundings	74 (71.8)	16 (15.5)	13 (12.6)
Social smile is usually absent in a child with autism	94 (91)	3 (2.9)	6 (5.8)

Table 3: Residents' responses regarding the second domain (impairment in communication)

Statement	Yes	No	Do not know
	No. (%)	No. (%)	No. (%)
Delay or total lack of development of spoken language	80 (77.7)	13 (12.6)	10 (9.7)

Table 4: Residents' responses regarding the third domain (obsessive and repetitive behavioral pattern) found in children with childhood autism

Statements	Yes	No	Do not know
	No. (%)	No. (%)	No. (%)
Stereotyped and repetitive movement	84 (81.6)	9 (8.7)	10 (9.7)
May be associated with abnormal eating habit	43 (41.7)	21 (20.4)	39 (37.9)
Persistent preoccupation with parts of objects	80 (77.7)	2 (1.9)	21 (20.4)
Love for regimented routine activities	79 (76.7)	6 (5.8)	18 (17.5)

Table 5: Residents' responses regarding the fourth domain (type of disorder autism is and possible associated co-morbidity)

Statements	Yes	No	Do not know
	No. (%)	No. (%)	No. (%)
Autism is childhood Schizophrenia	4 (3.9)	79 (76.7)	20 (19.4)
Autism is an auto-immune condition	5 (4.8)	80 (77.6)	18 (17.4)
Autism is a neuro-developmental disorder	48 (46.6)	34 (33)	21 (20.4)
Autism could be associated with mental retardation	38 (36.9)	35 (34)	30 (29.1)
Autism could be associated with epilepsy	28 (27.2)	30 (29.1)	45 (43.7)

Table 6: Usual age-onset of autism

	Neonatal age No. (%)	Infancy No. (%)	Childhood No. (%)
Usual age of autism diagnosis	7 (6.8)	29 (28.2)	67 (65.0)

Table 7: Residents' knowledge scores in different domains

Domain	Areas	No. of statements	Mean±SD	%
First	Impairments in social interaction	8	6.36±1.64	79.5
Second	Impairment in communication	1	0.78±0.42	78.0
Third	Obsessive and repetitive behavioral pattern	4	2.78±1.18	69.5
Fourth	Type of disorder autism is and possible associated co-morbidity	6	2.62±1.10	43.7
Total	All	19	13.18±2.80	69.4

Table 8: Participants' knowledge scores (Mean±SD) about autism according to their personal characteristics

Personal characteristics	No.	Mean±SD	P-value
Age			
• 26-30	76	13.29±2.94	
• 31-34	24	12.83±2.53	
• 35-39	3	13.33±0.58	0.785
Gender			
• Male	64	12.56±2.53	
• Female	39	14.21±2.95	0.003
Level of training			
• R1	24	12.13±2.98	
• R2	27	13.48±2.83	
• R3	20	13.30±2.13	
• R4	32	13.66±2.91	0.197
Residency program			
• Yanbu	23	12.26±2.70	
• Al Madinah	80	13.45±2.79	0.072
Attending workshops or conference about autism			
• Yes	19	13.32±2.26	
• No	84	13.15±2.92	0.822

Discussion

The increasing prevalence of ASD over the last few decades generates a unique challenge for general practitioners who frequently encounter autistic patients during their practice. Therefore, family physicians should have sufficient knowledge regarding the main characteristics of ASD for proper diagnosis, early intervention, and appropriate management [12].

Using the KCAHW scores, findings of the present study revealed that participant residents' knowledge about ASD was suboptimal. Their mean total knowledge score was 13.18±2.80 (out of 19), with 69.4% of their total responses being correct. Their knowledge gap was mainly related to the fourth domain, about information on type of ASD (2.62±1.10, 43.7%). On the other hand, their best knowledge regarding ASD covered the first domain about impairment of social interaction (6.36±1.64, 79.5%) and the second domain about impairment of communication and language development (0.78±0.42, 78%), while a lower mean score was attained for the third domain (obsession and compulsive pattern of behavior) (2.78±1.18, 69.5%).

These findings are in accordance with those of Bakare et al. [11], in Nigeria, who reported a total mean KCAHW score of participant healthcare workers similar to that of our study (12.35±4.40, 70.2%). However, they found that their knowledge gap was higher in the third domain, followed by the first, fourth and second domains, respectively.

Eseigbe et al. [13] noted that physicians' specialty was a significant factor related to their knowledge about ASD. Pediatricians had significantly enhanced knowledge and self-perceived competency, compared with general practitioners who had poor knowledge.

Zuckerman et al. [14] stated that primary care physicians should improve their knowledge of autism since they constitute the first professional point of contact with parents of children with a potential diagnosis of ASD. Several studies explained that poor knowledge among primary care physicians may be due to their outdated beliefs and misconceptions about symptoms of autism [15] or insufficient resources for management of ASD [16].

Rhoades et al. [17] noted that physicians who lack the necessary knowledge about ASD may miss critical opportunities for education about ASD and the important and prompt referral to appropriate services.

Despite the fact that family physicians play a vital role in early recognition and long-term management of ASD [18], only 18.4% of our participant residents attended workshops or conferences about autism. This clearly low attendance at training opportunities may reflect the need for more training facilities in Al Madinah and Yanbu for healthcare professionals who can be involved in the multidisciplinary approach for ASD management. Therefore, continuing medical education and training of our family medicine residents proved to be a pressing necessity for improving their current knowledge and filling up their identified areas of knowledge gap.

In agreement with our findings, lack of autism-specific continuing education or training [19], and low attendance rates where autism training does exist [20] were reported among primary care physicians. Therefore, receiving continuing medical education about autism enhances physicians' knowledge [15].

Bordini et al. [21] observed improvements in knowledge of primary care providers about autism with continuing medical education, while Major et al. [22] reported that knowledge among pediatric residents increased from 58.6% to 75.3%. In addition, Eray and Murat [23] reported an increased knowledge about autism from 34.7% to 88.0% after training. Odejide et al. [24] added that it is important to enhance knowledge of healthcare workers by training on improving diagnostic skills and the ability to adequately provide the necessary information to ASD patients and their caregivers regarding its management.

Our study revealed that residents' knowledge about ASD varied according to some of their personal characteristics. Males were significantly less knowledgeable than females. Older and senior (R4) residents were more knowledgeable than younger and junior (R1) residents. Also, residents in Yanbu were less knowledgeable regarding ASD than those in Al Madinah. However, a particularly alarming finding is that the continuing medical education (e.g., attending training courses or conferences) on ASD was not associated with better knowledge among family medicine residents. Therefore, it is highly recommended to improve and expand training opportunities for physicians on management of ASD.

It has been reported that more years of clinical experience were associated with higher knowledge about ASD [25], with primary care physicians' age being positively correlated with autism knowledge [26], as those aged more than 35 years had good knowledge levels [25].

In agreement with our findings, Austriaco et al. (12) noted that, among medical students and pediatric trainees, females rated understanding ASD behavior significantly higher than their male counterparts did ($p=0.005$), and attained significantly higher ratings for understanding the importance of ASD routine ($p=0.011$), as well as discussing the child's routine with the family ($p=0.003$).

Workshops and online conferences proved to be important for training on ASD screening [18]. Bauer et al. [27] focused on adding an autism-oriented module to a pre-existing computer system that could automatically provide screening, diagnosis, and referral feedback based on information provided by the primary care physicians.

Murthy and Wig [28] suggested that training approaches for primary healthcare physicians that aim at enhancing the availability of mental healthcare manpower should include evaluation of healthcare workers' existing knowledge of and attitudes toward mental disorders, assessment of existing training materials, evaluation of the needs for new training materials and evaluation of the support and supervision needed to carry out their duties.

In Nigeria, Bakare et al. [11] reported that knowledge about childhood autism (KCA) as measured by the KCAHW questionnaire was significantly associated with age group distribution of the healthcare workers, with those age group of fourth decades and above more likely to have

higher mean score ($p=0.004$) and previous experience of managing children with autism spectrum disorders (ASD) ($p<0.001$). KCA showed near significant association with area of specialty, with those healthcare workers in psychiatry compared to pediatrics having higher mean score ($p=0.071$) and also with years of working experience of the healthcare workers ($p=0.056$). More than half of the healthcare workers subscribed to the opinion that facilities and law caring for the needs and rights of children with childhood autism and other developmental disorders are lacking in Nigeria.

Conclusion

Knowledge of family medicine residents regarding childhood autism is suboptimal. Correlates of KCA may help in selection of healthcare workers that would best provide health education and management for caregivers of children with autism. It is important to update the knowledge gaps of healthcare workers who have limited knowledge regarding childhood autism and to train them to be able to provide healthcare service that would ensure early diagnosis and interventions for management of autism.

References

1. World Health Organization. Autism spectrum disorders. WHO, 2021. Website: <https://www.who.int/news-room/fact-sheets/detail/autism-spectrum-disorders>. Accessed on November 20th, 2021.
2. CDC. What is Autism Spectrum Disorder? Centers for Disease Control and Prevention, 2020. Website: <https://www.cdc.gov/ncbddd/autism/facts.html>. Accessed on November 19th, 2021.
3. Huquet G, Ey E, Bourgeron T. The genetic landscapes of autism spectrum disorders. *Annu Re Genomics Hum Genet.* 2013; 14: 191-213.
4. Rosenberg RE, Law JK, Yenokyan G, McGready J, Kaufmann WE, Law PA. Characteristics and concordance of autism spectrum disorders among 277 twin pairs. *Arch Pediatr Adolesc Med.* 2009; 163(10): 907-914.
5. Sumi S, Taniai H, Miyachi T, Tanemura M. Sibling risk of pervasive developmental disorder estimated by means of an epidemiologic survey in Nagoya, Japan. *J Hum Genet.* 2006; 51: 518-522.
6. Lyall K, Croen L, Daniels J, Fallin MD, Ladd-Acosta C, Lee BK. The Changing Epidemiology of Autism Spectrum Disorders. *Annu Rev Public Health.* 2017; 38: 81-102.
7. Fombonne E. Epidemiological controversies in autism. *Swiss Arch Neurol Psychiatr Psychother* 2020; 171: w03084.
8. Qoronfleh MW, Essa MM, Alharabsheh ST, Al-Farsi Y, Al-Adawi S. Autism in the Gulf States: A regional overview. *Front Biosci (Landmark Ed.)* 2019; 24: 334-346.
9. Alshammari MS, Afify AAM, Abdelhay O. Perception and convenience of caring for children with autism spectrum disorder among family medicine residents in Riyadh 2018. *J Family Med Prim Care* 2019; 8(6) (2019): 1902-1907.
10. Raosoft Sample Size Calculator. Website: Sample Size Calculator by Raosoft, Inc.

11. Bakare MO, Ebigbo PO, Agomoh AO, Menkiti NC. Knowledge about childhood autism among health workers (KCAHW) questionnaire: description, reliability and internal consistency. *Clinical practice and epidemiology in mental health* 2008; 4:17.
12. Austriaco K, Aban I, Willig J, Kong M. Contemporary Trainee Knowledge of Autism: How Prepared Are Our Future Providers? *Front. Pediatr.* 2019; 7:165.
13. Esegbe EE, Nuhu FT, Sheikh TL, Esegbe P, Sanni KA, Olisah VO. Knowledge of childhood autism and challenges of management among medical doctors in Kaduna State, Northwest Nigeria. *Autism Research and Treatment*, 2015; 892301:1–6.
14. Zuckerman KE, Mattox KE, Donelan K, Batbayar O, Baghaee A, Bethell C. Pediatrician identification of Latino children at risk for autism spectrum disorder. *Pediatrics*, 2013; 132(3): 445–453.
15. Rahbar MH, Ibrahim K, Assassi P. Knowledge and attitude of general practitioners regarding autism in Karachi, Pakistan. *Journal of Autism and Developmental Disorders*, 2011; 41(4): 465–474.
16. Unigwe S, Buckley C, Crane L, Kenny L, Remington A, Pellicano, E. GPs' confidence in caring for their patients on the autism spectrum: an online self-report study. *British Journal of General Practice*, 2017; 67(659): e445–e452.
17. Rhoades RA, Scarpa A, Salley B. The importance of physician knowledge of autism spectrum disorder: results of a parent survey. *BMC Pediatrics* 2007, 7:37. doi:10.1186/1471-2431-7-37.
18. Carbone PS, Farley M, Davis T. Primary Care for Children with Autism. *Am Fam Physician* 2010; 81(4):453-460.
19. Zerbo O, Massolo ML, Qian Y, Croen LA. A study of physician knowledge and experience with autism in adults in a large integrated healthcare system. *Journal of Autism and Developmental Disorders*, 2015; 45(12):4002–4014.
20. Haider A, Shehzad S. Survey regarding the need of intensive training workshops for the autism community. *Pakistan Journal of Medical and Health Sciences*, 2015; 9:1325-1328.
21. Bordini D, Lowenthal R, Gadelha A, De Araujo Filho GM, Mari DJ, Paula CS. Impact of training in autism for primary care providers: a pilot study. *Revista Brasileira de Psiquiatria*, 2015; 37(1):63–66.
22. Major NE, Peacock G, Ruben W, Thomas J, Weitzman CC. Autism training in pediatric residency: evaluation of a casebased curriculum. *Journal of Autism and Developmental Disorders*, 2013; 43(5):1171–1177.
23. Eray S, Murat D. Effectiveness of autism training programme: an example from Van, Turkey. *The Journal of the Pakistan Medical Association*, 2017; 67(11):1708–1713.
24. Odejide AO, Morakinyo JJ, Oshiname FO, Omigbodun O, Aguwon AJ, Kola L. Integrating mental health into primary health care in Nigeria: management of depression in a local government (district) area as a paradigm. *Seishin Shinkeigaku Zasshi* 2002; 104(10):802-9.
25. Hend MS. Assessment of family physicians' knowledge of childhood autism. *Family Medicine and Community Health*, 2017; 5(4):266–274.
26. Khatri GK, Onta SR, SureshT, Choulagai, BP. Knowledge and management practices of paediatricians about autism spectrum disorder in Kathmandu, Nepal. *Journal of Nepal Paediatric Society*, 2011; 31(2):98–104.
27. Bauer NS, Carroll AE, Saha C, Downs SM. Computer decision support changes physician practice but not knowledge regarding autism spectrum disorders. *Applied Clinical Informatics*, 2015; 6(3): 454–465.
28. Murthy RS, Wig NN. The WHO collaborative study on strategies for extending mental health care IV: A training approach to enhancing the availability of mental health man power in a developing country. *Am J Psychiatry* 1983; 140(11):1486-90.