

Prevalence of Atopic Dermatitis and its Associated Factors Among 4–12-Month-Old Infants Attending Primary Health Care Corporation in Qatar

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Abstract

Atopic Dermatitis, or Eczema, is one of the most common skin inflammation disorders worldwide. The disease has high prevalence rate, socioeconomic costs, and lacks the availability of curative and preventative measures. The burden of the disorder has been increasing over the past few decades for several reasons that are yet to be understood. In this study, we investigate the effects of several risk factors on the development of AD in 4-12 month old infants attending PHCC centers across Qatar. A total of 775 participants completed a questionnaire that addressed risk factors associated with AD. 121 of the 775 (15.6%) subjects had confirmed diagnoses of some form of AD (mild, moderate, or severe) while the rest were in the non-AD group n=654 (84.4%). Multiple factors, previously thought to influence the occurrence of AD, were proven to

have no association with the disorder's occurrence. Those factors include the duration of pregnancy, the type of delivery, breastfeeding, artificial milk feeding, and weaning age. Moreover, we found genetics to play a significant role in determining a child's predisposition to developing AD in their first year of life ($p<0.05$). By ruling out those factors, we can move forward to determine other key factors that may play a role in causing AD in young children in Qatar and worldwide.

Key words: Atopic Dermatitis, Eczema, Prevalence, Risk Factors, Qatar.

Introduction

Medical research has led to significant discoveries, the development of therapeutic interventions, and most importantly, the improvement of the healthcare system and public health. However, knowledge gaps still exist, and many questions remain unanswered. Over the past few decades, Qatar has become equipped with several strong institutions to support novel research where major medical breakthroughs have been achieved. There has been research that generates new knowledge to create evidence that is applied in everyday medical practices to promote the highest possible quality of life for every patient. However, an article published in 2019 about atopic dermatitis found increased trends in eczema prevalence in the Middle East(1). Hence, early childhood skin disorders; prevalence, causes, risk factors, and management are yet to be studied in more depth.

Skin Inflammation Disorders vary greatly in symptoms, severity, and age of occurrence. One of the most common ones is Atopic Dermatitis (AD), also known as Eczema. AD is a chronic inflammatory disorder of the skin that usually has an early childhood onset(1). The majority of AD cases occur before the age of 5 years. It occurs in those with an "atopic tendency", meaning that they may develop other, or all closely linked conditions such as food allergies, asthma, and/or allergic rhinitis. Slight female to male predominance is seen in previous data with a ratio of 1.3-1 respectively(2). AD symptoms differ from one person to another and include skin dryness, itchiness, skin scaling, and in extreme cases, open, crusted, or weeping sores. Not only that, but AD also increases susceptibility to viral, bacterial, and fungal skin infections. Worldwide, AD affects approximately 5-20% of children(3). The incidence rate seems to be increasing; urban areas and developed countries show increased occurrence(4).

Atopy is the genetic predisposition to develop allergic diseases due to immune sensitization to common harmful allergens such as inhaled and ingested allergens. IgE antibodies are produced and symptoms are developed when the body is exposed to such allergens(5). Children with early-onset AD were found to have a higher risk of developing food allergies than those with late-onset AD. In children who do not have AD, food allergies are only found 5% of the time(5). Yet, children with AD are found to have food allergies with a prevalence of 30-40%. Up to 80% of children will have high food-specific IgE concentrations, even when true food allergies are not detected(6).

Due to the varying levels of manifestations of AD and the lack of appropriate laboratory tests, the diagnosis of this dermatologic disease can be complex; major and minor characteristics must be taken into account when diagnosing it. For accurate diagnosis and treatment, the severity of AD must be measured in an objective manner in clinical practices. This can help in comparing disease improvement before and after treatment. Nonetheless, it is also important to recognize the familial history of the disease; genetics is found to be a dominant cause for atopic dermatitis. Research has found that the chances of developing AD increase with family history of atopic diseases(7). For example, children of a parent with AD are 2-3 times more likely to develop AD, while those where both parents are atopic are 3-5 times more likely(7). When experimenting with twins, a study found concordance rates of 80% in monozygotic twins and 20% in dizygotic twins(3). Lastly, previous experiments found that approximately 70% of patients show a positive family history of AD(3).

Furthermore, monitoring the feeding plan during the child's infancy and childhood periods may play a significant factor in the diagnosis and treatment plan of AD. Several studies have been conducted to evaluate the influence of dietary manipulation after birth(9). Those included the effects of

breastfeeding, formula usage, and the age of solid food introduction. Most studies looking at the protectivity level of breastfeeding vary widely in results. For example, a meta-analysis of 18 studies showed significant protective results when babies are breast fed during the first 3-6 months after birth(8). The American Academy of Dermatology Guidelines Task Force found no conclusive evidence on whether breastfeeding prevents AD(9). Similarly, a study found no protective effects for soy milk formula or cow milk formula(10). In addition, observational studies have found an increased risk of developing food allergies and AD when solid foods are introduced early. However, no specific studies have been conducted to examine the effects of delaying solid foods on preventing AD(11).

The different clinical features associated with AD and its fluctuating course of occurrence make creating a treatment plan difficult and varying. Educating patients and parents about skincare maintenance such as maintaining skin hydration and avoiding irritants and triggers like certain soaps and detergents, fragrances, certain clothing fabrics, sweat, psychosocial stress, and more, plays a major role in resolving AD manifestations. Preventative measures include the use of probiotics pre- and post-natally especially for high-risk mothers while breastfeeding(12). However, due to inconsistency among studies, specific probiotic types, dosages, or length of time to use supplements cannot be recommended. Furthermore, for the prevention of AD development, there is inadequate evidence for advising parents to avoid specific foods during pregnancy or while breastfeeding(13,14).

Topical anti-inflammatory medications are used to suppress the inflammatory response. Steroids are classified based on their potency: class VII (low potency) to I (super potent). Low potency steroids are used for areas with sensitive skin such as the face, neck, and skin folds. Moderate-potency steroids are usually used for the trunk and the legs and arms. Furthermore, TCIs, (Topical Calcineurin Inhibitors), are immunosuppressive agents that inhibit the function of T-cells. TCIs are used long-term on areas where steroids pose risk (i.e., face and eyelids)(15). Pruritis management focuses on reducing exposure to triggers, restoring the skin barrier, as well as suppressing inflammation. Oral antihistamines use has been found to reduce itching sensation, scratching, and trauma to skin(16). Furthermore, education and raising awareness are critical when it comes to preventing and reducing symptoms. Patients and parents must always be reminded of the importance of paying attention to triggers that could lead to viral and bacterial skin infections.

To date, there has been insufficient information regarding the prevalence of atopic dermatitis in Qatar and the relevant factors contributing to its high occurrence rate in infants 12 months old and younger. Nutrition during pregnancy, infancy, and toddlerhood is a key factor in influencing children's growth and development. For example, breastfeeding is thought to reduce the incidence of allergic diseases and strengthening the immune system. Therefore, in this research, we aim to estimate

the prevalence of atopic dermatitis in Qatar as well as explore factors associated with its occurrence. We also aim to support previous research data in finding the most accurate risk factors associated with AD. By investigating the management strategies mostly used by parents of affected children, the closer we are to the development of suitable preventative measures concerning weaning and nutritional practices.

Materials and Methods

Study Design and Setting:

A nested case-control study design was used in this study. The study was carried out in accordance with the guidelines of the Primary Health Care Corporation, Clinical Research Department, Qatar, after passing through the ethical committee. Participants were selected from six Health Centers representing the three different regions in Qatar providing Well-Baby Care between January 2020 and December 2020.

A comprehensive questionnaire based on the scoring European Task Force on Atopic Dermatitis/SCORAD was developed and validated based on variables and information obtained from similar previous studies(17). The questionnaire addresses information to estimate the prevalence of atopic dermatitis in Qatar and its related risk factors.

Parents of qualifying participants were requested to answer the questionnaire while the infant was being seen by the pediatrician. Participating pediatricians assessed patients using the European Task Force on Atopic Dermatitis scoring scale SCORAD (SCORing Atopic Dermatitis).

Study Population:

A total of 775 children were recruited in the study after obtaining consent from the children's parents/guardians. A non-probability sampling technique was used where the targeted sample was all children aged between 4 and 12 months attending Primary Health Care Corporation Centers across Qatar and whose parents can speak and read either Arabic or English. Infants diagnosed with lactose intolerance, celiac disease, G6 PD disease, psoriasis, ichthyosis, and congenital lupus erythematosus were excluded from the study.

Statistical Analysis:

Statistical Package for Social Sciences (IBM SPSS V.20) was used for data entry and analysis. Demographic characteristics and AD risk factors between AD and non-AD groups from the dermatological examination and questionnaire survey were analyzed using the chi-squared test. Then, the odds ratio (OR) and 95% confidence interval (CI) were calculated by logistic regression analysis by the stepwise selection method. A p-value lower than 0.05 was considered statistically significant.

Results

A total of 775 participants completed the questionnaire and sociodemographic information was collected to assess possible factors associated with atopic dermatitis occurrence in 4–12 month-old infants attending PHCC in Qatar. Participants' demographics are summarized in Table 1.

Out of the 775 infants assessed, 121 (15.6%) infants were diagnosed with AD while the other 654 (84.4%) were in the non-AD group. Of those cases 64.5% were mild AD, 26.4% were moderate AD and 9.1% were severe cases of AD (Figure 1).

AD was more prevalent among children aged between 10 to 12 months than the children aged 4 to 9 months (74.4% -25.6% respectively) and in male children (54.5%) than in female children (45.5%). Of those 36 (54.5%) were Qatari patients while the remaining 85 (70.2%) were non-Qatari (Table 1).

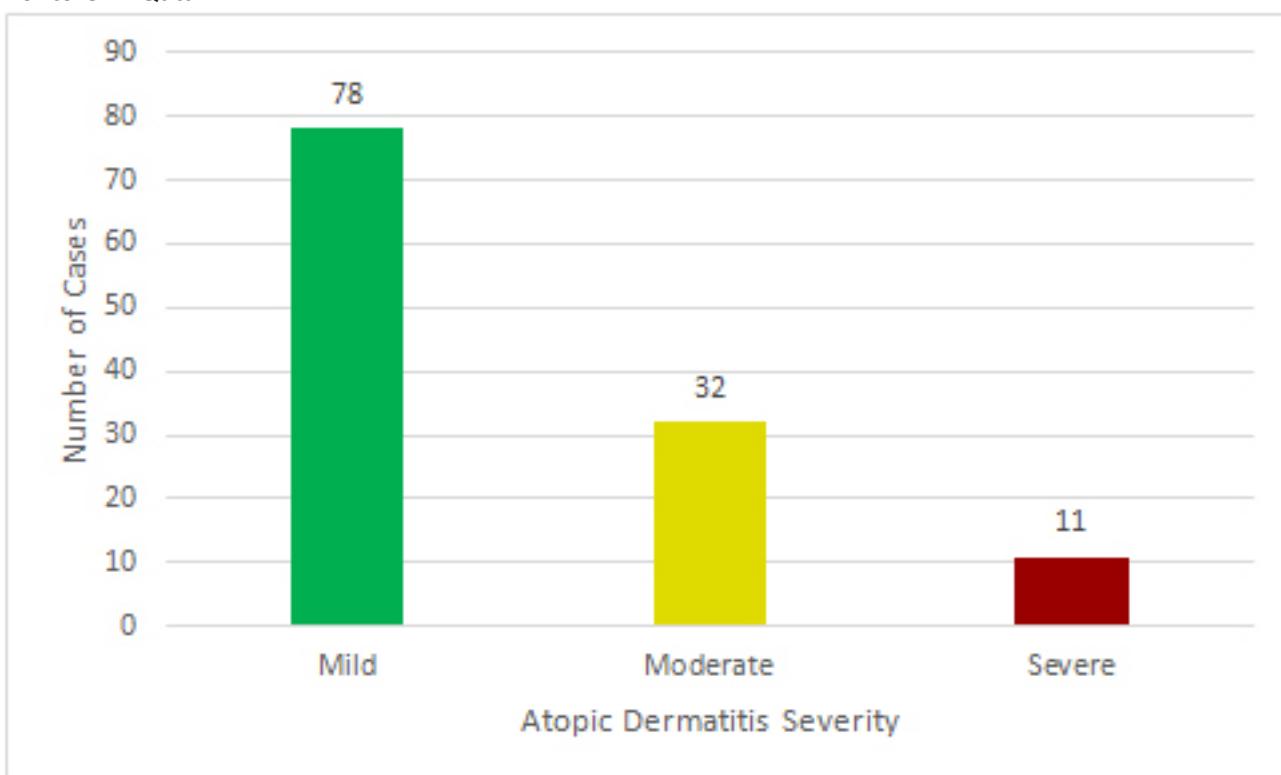
Also, we found that AD is higher in children who had a normal vaginal delivery (74.4%) and were complete term (9 month pregnancy). Also, it is higher in children who are on artificial milk feeding (61.2%) than the others (37.2%). As shown in Table 1, when the relation between AD and non-AD was assessed, it was found that children whose mother had a disorder during pregnancy were less likely to be diagnosed with AD (22.3%) compared to children whose mother did not have any disorders during pregnancy (77.7%). It is also seen that children who have a family history of AD show higher AD predisposition (76%) compared to those who do not have a family history (23.1%); this finding was statistically significant ($P <0.01$) (Table 1). Results from logistic regression analysis after adjustment for the other factors showed that the risk of atopic dermatitis was significantly higher for children who had a family history ($OR=6.41$; 95% CI: 4.04–10.17) (Table 2).

Table 1: Sociodemographic Characteristic for the Study (Population N=775)

Characteristics	Study Population (n=775)	AD group n=121(15.6%)	Non-AD group n=654 (84.4%)	P-value
Gender (n %)				0.48
Male	n=400(51.6%)	66(54.5%)	334 (51.1%)	
Female	n=375(48.4%)	55(45.5%)	320(48.9%)	
Nationality (n %)				<0.01
Qatari	n=126	36(29.8%)	90 (13.8%)	
Non-Qatari	n=649	85(70.2%)	564 (86.2%)	
Age, mean \pm SD (months)		10.3 \pm 2.6	9.27 \pm 3.1	0.01
4 to 9 months	N=304	31 (25.6%)	273(41.7%)	
10 to 12 months	n=471	90(74.4%)	381(58.3%)	
Pregnancy Duration (n %)				0.98
Less than 9 months	n=19	3(2.5%)	16 (2.4%)	
9 months	n=756	118(97.5%)	638(97.6%)	
Type of Delivery (n %)				0.12
Normal	n=530	90(74.4%)	440(67.3%)	
CS	n=245	31(25.6%)	214(32.7%)	
Mother had disorder during pregnancy (n %)				0.79
Yes	n=180	27(22.3%)	153 (23.4%)	
No	n=595	94(77.7%)	501 (76.6%)	
Mother's Feeding triggered allergy (n %)				<0.01
Yes	n=82	36(29.8%)	46 (7%)	
No	n=693	85(70.7%)	608 (93%)	
Dominant Breast Feeding (n %)				0.18
Yes	n=157	30(24.8%)	127 (19.4%)	
No	n=618	91(75.2%)	527 (80.6%)	
Mixed Feeding (n %)				<0.01
Yes	n=150	9(7.4%)	141 (21.6%)	
No	n=625	112(92.6%)	513 (78.4%)	
Artificial milk feeding only (n %)				<0.01
Yes	n=468	74(61.2%)	394 (48.2%)	
No	n=307	45(37.2%)	262 (85.3%)	
Weaning Age, mean \pm SD (months)		3.8 \pm 2.8	2.9 \pm 2.7	<0.01
Family History (n %)				<0.01
Yes	n=306	93(76.9%)	213 (32.6%)	
No	n=469	28(23.1%)	441 (67.4%)	
Environmental triggers (n %)				0.13
Yes	n=5	2(1.7%)	3 (0.5%)	
No	n=770	119(98.3%)	651 (99.5%)	
Food Allergy (n %)				<0.01
Yes	n=68	27 (22.3%)	41 (6.3%)	
No	n=707	94 (77.7%)	613 (93.7%)	

Table 2: Logistic Regression of the Factors Associated With AD:

Risk Factors	OR (95%CI)	P value
Pregnancy Duration	0.83 (0.22 to 3.11)	0.78
Type of delivery	1.33 (0.82 to 2.14)	0.25
Mother had disorder during pregnancy	0.90 (0.54 to 1.51)	0.69
Breast feed only	1.26 (0.79 to 2.02)	0.34
Mixed feeding	0.40 (0.19 to 0.84)	0.02
Weaning age	1.13 (1.05 to 1.22)	0.001
Family History	6.41 (4.04 to 10.17)	<0.05

Figure 1: Severity of Atopic Dermatitis in Well Baby and Walk-in Clinics at Primary Health Care Corporation Centers in Qatar.

Discussion

Atopic Dermatitis (AD), commonly known as Eczema, is a chronic, relapsing, and often intensely pruritic inflammatory disorder of the skin. It is the most common type of skin disorders worldwide with a slight increasing trend in prevalence of cases over the past few years. AD occurs for several complex reasons that have not been fully understood still. Numerous underlying genetic and environmental factors can influence the severity, frequency and expression of AD. Multiple studies have proved genetic factors contribute to AD. However, environmental factors must also be taken into consideration as they play a role in the development and manifestation of AD symptoms. Furthermore, it has been recognized that AD is not just a single disease; it is often associated with other atopic disorders such as asthma, food allergies, allergic rhinitis, and others(18). Moreover, AD strongly influences the quality of life of patients and their families;

it often leads to social and economic issues(19). In this study, we shed light on several factors that may contribute to the development of AD in infants 4-12 months old while supporting recent studies focused on eliminating risk factors previously thought to influence AD development.

This study was able to provide supporting evidence to previous research conducted to evaluate the relevance of food exposure in causing AD. In this study, we were fortunate enough to confirm the lack of correlation between different types of food and AD. Certain foods previously thought to cause allergic reactions, including AD, were found to not play a role in determining a child's allergies. The majority of parents believe their infant's experience of food introduction is the main cause of their AD. This in turn leads the parents to limit their child's exposure to certain foods that are known to cause food allergies. It is important to recognize that this limit of exposure can cause certain sensitivities and malnutrition if the child does not receive supplements to replace the foods that

are eliminated for prolonged periods of time(13). This misconception can be due to the association between eczema and food allergies. It is important to bear in mind that food does not cause AD, but food allergies can trigger a person's AD symptoms to flare since atopic conditions can be comorbid(2). This is also supported by many previous studies that identified the major role food allergy plays in exacerbating symptoms in severe forms of AD. In those studies, patients diagnosed with AD and food allergy were advised on strict diets where allergy causing foods were eliminated but were replaced by other foods to maintain proper nutrition. Statistically significant reduction in AD symptoms was measured while children still received appropriate nutrients(20).

Furthermore, other risk factors associated with pregnancy and delivery such as the pregnancy duration, mother's health during pregnancy, and type of delivery were found to have little to no effects on AD symptoms. This supports the systematic review published in 2015 to investigate the correlation between mode of delivery and the development of atopic diseases in children. This review found no significant difference between caesarean section and vaginal deliveries in causing atopic dermatitis(21). Nonetheless, in this study, mother's physical and mental health was not addressed in detail. Although the mothers were asked whether they were ill during their pregnancy, we did not dive into more details about their kind of illness in our questionnaire. A review study including 11 studies on the relationship between mothers' mental health and children's risk of developing AD found positive correlation between the two. The review highlighted the importance of stress reduction programs implementation for pregnant women(22). Therefore, further research addressing mothers' mental and physical health's contribution to childhood AD is needed to eliminate possible risk factors and provide more appropriate treatments.

Also, weaning age was significant but not enough to support its advantage in preventing AD. There has not been clear scientific evidence to support or deny the role weaning age plays in causing AD(8). Moreover, there is no significant difference between the AD group and non-AD group. The results show that 24.8% of the AD group were breastfed while 19.4% of the non-AD group were breastfed. Therefore, according to our findings, breastfeeding is not predictive for AD. Although breastfeeding is known to have many physiological and psychological benefits for both children and feeding mothers, there have been many inconsistent findings according to the American Academy of Allergy, Asthma & Immunology as well as the European Academy of Allergy and Clinical Immunology(23). However, more research needs to be done in this area. For example, it would be beneficial to study the effects of breastfeeding on a larger group of participants with further restricted criteria.

Qatar, like the other Gulf Corporation Council countries (GCC), including Saudi Arabia, United Arab Emirates, Sultanate of Oman, Kuwait, and Bahrain), requires further research to address serious dermatological conditions

in pediatric cases. In our investigation, we were able to recognize the increasing prevalence rate of AD in Qatar, which most probably applies to other GCC countries. We found that 15.6% of PHCC pediatric patients were diagnosed with AD. This is consistent with a study conducted in 2019 that suggested growing regional burden of AD in the Middle East and Africa(1). It is important to note that this finding supports international data of AD. In a study published in 2020, the global prevalence of AD was found to affect 15-30% children every year(24). Atopic dermatitis is one of the most common causes of frequent visits to dermatologists and pediatricians. It is a disorder that must be monitored closely, especially in the first year of an infant's life. Therefore, it requires special attention and consistent follow up appointments.

Conclusion

This study found increasing trends of Atopic Dermatitis in 4–12 month old infants attending Primary Health Care Corporation Centers in Qatar when compared to studies from previous years. Several risk factors previously thought to influence AD occurrence were shown to have insignificant relevance in causing AD. These factors include pregnancy duration, delivery mode, weaning age, and type of milk fed to baby in their first months of life. Moreover, AD was found to occur due to genetic reasons that need to be studied in more detail. Other limitations to the study include limited history and information from parents of participating infants. Other factors such as GCC countries' weather must also be taken into account when addressing allergic diseases such as AD. Lastly, by conducting this study and publishing our findings, we aim to communicate the importance of educating parents about significant AD management and prevention strategies that can help them care for their infants. We would like to raise awareness between parents and/or future parents on the importance of proper feeding methods and food introduction strategies for their children.

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