



A Systematic Review of Autism Spectrum Disorder Research in the Arab World

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Abstract

This review examines research on the status of Autism Spectrum Disorder (ASD) research in the Arab World. While exploring the literature, 172 publications dating from 2014 to 2022 were identified. On average, there were 5.1 articles published per year for each country (Average is based in the 22 countries). In terms of published ASD studies, the most prolific countries were Saudi Arabia, Egypt, and the United Arab Emirates. The ASD studies explored areas related to biology, potential risk factors, and diagnosis of autism-related issues. A third of these papers featured acknowledgments for any financial support they received, while others were printed in Journals with Impact Factors (JIF) of 5.1. These results indicate that ASD research in Arab countries has grown exponentially and is still developing in the region. The results and implications are presented, and future research efforts are proposed.

Keywords: Autism Spectrum Disorder, ASD research, Arab world, autism, and ASD.

مراجعة منهجية لأبحاث اضطراب طيف التوحد في العالم العربي

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المخلص:

تتناول هذه المراجعة بحثًا حول حالة أبحاث اضطراب طيف التوحد في العالم العربي. أثناء استكشاف الأدبيات، تم تحديد ١٧٢ منشورًا يرجع تاريخها إلى الفترة من ٢٠١٤ إلى ٢٠٢٢. في المتوسط، تم نشر ٥.١ مقالة سنويًا لكل بلد (يستند المتوسط في ٢٢ دولة). من حيث دراسات التوحد المنشورة، كانت المملكة العربية السعودية ومصر والإمارات العربية المتحدة من أكثر الدول إنتاجًا. استكشفت دراسات التوحد المجالات المتعلقة بالبيولوجيا وعوامل الخطر المحتملة وتشخيص المشكلات المتعلقة بالتوحد. تضمنت ثلث هذه الأوراق إقرارات تقديرية لأي دعم مالي تلقوه، بينما طُبع البعض الآخر في المجالات ذات العوامل المؤثرة من ٥.١. تشير هذه النتائج إلى أن أبحاث التوحد في الدول العربية قد نمت بشكل كبير ولا تزال تتطور في المنطقة. تم عرض النتائج والآثار، وتقدم الجهود البحثية المستقبلية.

الكلمات المفتاحية: اضطراب طيف التوحد، أبحاث التوحد، العالم العربي.

Introduction

Autism Spectrum Disorder (ASD) is a common neurodevelopmental disorder mostly observed in childhood. ASD is a complex neurological condition impacting an individual's ability to communicate and interact socially (Morales-Hidalgo et al., 2018). Multiple factors are cited as potential causes, with genetic conditions being the most pronounced risk factors (Oneib et al., 2022). Individuals with ASD manifest unique ways of communicating, interacting, and learning, but minimal physical features distinguish them from others. The condition's signs manifest before three years of age, with most showing signs within the first 12 months of life (Parmeggiani et al., 2019). The symptom may improve with age, depending on the interventions implemented. ASD's incidence worldwide is under 1% of the population, approximately 1 in 160 children, with higher estimates in Western, high-income countries (Lord et al., 2019). Research on ASD has grown significantly over the past decades with the growing interest in understanding its etiology and societal impacts (Happé & Frith, 2020). In the Arab world, the research on this disorder is relatively young compared to Western countries (Clark & Adams, 2020). The research difference between the two overshadows the understanding of ASD's effects and management in the Arab region.

The Arab world makes up a significant portion of the global population. It is comprised of 22 countries located in North Eastern Africa and Asia. Together, their population exceeds 300 million people (Alnermary et al., 2017). Based on the estimated global incidence rate of ASD of 1 in 160 children, the condition affects a significant portion of the Arab population. Despite being a lifelong condition, ASD intersects racial, ethnic, and social economic boundaries (Alkhateeb et al., 2022). Consequently, the higher estimated incidence rate in Western countries is highly likely to define the situation of ASD in Arab countries. In the last two decades, studies regarding ASD in the Arab world have increased profoundly. There are still significant information disparities concerning various aspects of ASD, especially epidemiology, characteristics, burden, and support available to patients and their families (Alkhateeb et al.).

The confirmed cases of ASD remain unknown in most Arab countries (Qoronflesh, 2019). According to current reports, the prevalence rate of ASD in Arab countries ranges from 1.4 to 59 per

10,000 children (Al-Farsi et al., 2019). Saudi Arabia has the highest prevalence rate, with approximately 59 per 10,000 children, while the range in Arabian Gulf countries, including Oman, is 1.4-29 per 10,000 children (Al-Farsi et al.). Compared to the rest of the world, the prevalence rates in the Arab world are inconsistent, indicating a higher degree of inaccuracy. This information gap is attributed to limited and relatively young research on ASD (Al-Mamri et al., 2019). In the Arab world, there is scant cognizance and consciousness of ASD which further reduces the number of confirmed cases. However, underdeveloped pediatric services in some countries, such as Oman, contribute to the underestimation of ASD prevalence (Al-Mamri et al.). These knowledge gaps undermine the policies, services development, and strategies to manage ASD in the Arab world.

A review of the research literature reveals only four studies on ASD research in the Arab world have been documented, indicating a slow development in this field despite its sensitivity and importance. The most recent literature reviews on ASD include Alnermary et al. (2017) and Alallawi et al. (2020). Alallawi et al. (2020) identified 70 studies on ASD published by authors from different Arab countries, mostly Saudi Arabia and Lebanon. The reviewed studies focused on various aspects of ASD, including social, educational, and psychological. Most of these studies were of low quality, thereby providing less reliable information on the disorder. On the other hand, Alnermary et al. (2017) identified 142 studies on ASD from Arab countries, with the majority focusing on biology, risk factors, and diagnosis. The existing research in this region inadequately addressed intervention, services available, and life span issues related to ASD. This review aims to examine these factors to provide a more complete picture of the current status of ASD research in Arab countries.

Objectives

This review aims to augment the current body of evidence by exploring the existing literature on ASD in Arab countries. The research questions guiding this review include: (a) what aspects of ASD are explored, (b) the growth in ASD research since 2014, (c) the specific countries where ASD research is undertaken, and (d) the effects of the existing ASD studies.

Method

Search Strategy and Selection Conditions

Medline-indexed journals and articles were searched using Web of Science, EBSCOhost, and PudMed databases from February 2014 to December 2022. Grey literature was searched in the World Health Organization's library database. Key search terms included "Autism" OR "Autism spectrum disorder" and "Algeria" OR "Bahrain" OR "Comoros" OR "Djibouti" OR "Egypt" OR "Iraq" OR "Jordan" OR "Kuwait" OR "Lebanon" OR "Libya" OR "Mauritania" OR "Morocco" OR "Oman" OR "Palestine" OR "Qatar" OR "Saudi Arabia" OR "Somalia" OR "Sudan" OR "Syria" OR "Tunisia" OR "United Arab Emirates" OR "Yemen" OR "Arab Countries" OR "Arab World." Research articles were included in the review if the authors were from Arab countries, published in English, and formal diagnostic criteria for ASD were met. Conversely, articles were excluded if they could not be obtained, the ASD description was contrary to formal diagnostic criteria, and the population had a non-Arabian origin.

To guarantee a complete and up-to-date collection of relevant research articles, the researcher used particular databases. The selected databases presumably included medical and psychological research, especially on autism and developmental problems in the Arab world. The researcher used various databases to avoid missing crucial studies that were limited to one database. Combining databases gave a complete and more robust dataset.

Data Extraction

The identified publications were analyzed using four variables for data extraction (i.e., year of publication, ASD research areas, country, and impact factor). The country indicated where the research was conducted, with those focusing on more than one country categorized as multi-country. The number of articles focusing on more than one country indicates the degree of collaboration in research. The publication year was utilized to determine the growth of ASD research over time. Research areas were categorized by content which included risk factors, services, lifespan issues, interventions and treatment, diagnosis, and biology. Table 1 shows ASD studies' research areas. Lastly, the Thomson Reuters'©' impact factor (JIF) was used to estimate the effects of the identified publications (Mahmood, 2017). Although it is not an effective measure, it is essential for examining the evolution of research.

Table 1*ASD Studies' Research Areas*

Research Area	Purpose
Risk factors	Identifying factors contributing to the prevalence or occurrence of ASD in the Arab world.
Services	Promoting access to high-quality and evidence-based services among people with ASD in Arab countries. This includes aspects like family-wellbeing services and affordable services, including education and healthcare.
Lifespan issues	Examining how autism influences the needs of individuals and exploring how these needs are met or can be improved to enhance individuals' lives.
Interventions and treatment	Examining effective interventions which are safe for use across lifespan for people with ASD.
Diagnosis	Exploring how well the symptoms and signs of ASD are recognized to enable early interventions and reduce the risk of disability.
Biology	Identifying the biological aspects of autism. These aspects can provide the foundation of ASD research.

Results**Study Selection**

The initial search yielded a total of 238 titles. Further examination based on the selection criteria excluded 53 studies due to repetition, duplication, inaccessibility, or the majority non-Arabian study population. Thirteen additional studies were excluded for inconsistent definitions of ASD, resulting in 172 publications. Among the remaining publications, 146 studies were primary literature, and 26 were secondary literature, mainly literature reviews. Table 2 presents the overview of the reviewed studies and Table 3 shows the types of databases that were used, the number of researches obtained from each base and total number of research done.

Table 2*Overview of the Reviewed Studies*

Intext citation	Title	Study type	Research Area	Number of participants	Number of studies
Al-Farsi et al. (2019)	Prevalence of autistic spectrum disorders in the Sultanate of Oman	Systematic review	Risk factors Diagnosis	113	-
Alkhateeb et al. (2022)	The impact of autism spectrum disorder on parents in Arab Countries	Systematic review	Lifespan Issues	3299	24
Al-Mamri et al. (2019)	Revisiting the prevalence of autism spectrum disorder among Omani children.	Cross-sectional study	Risk factors Services	1705	-
Alnemary et al. (2017)	Autism research: Where does the Arab World stand?	Systematic review	Risk factors, Biology, Services Lifespan issues Diagnosis Treatment and interventions		142
Christensen & Zubler (2020)	From the CDC: Understanding Autism Spectrum Disorder: An evidence-based review of ASD risk factors, evaluation, and diagnosis.	Review	Risk factors	-	-

Clark & Adams (2020)	Listening to parents to understand their priorities for autism research.	Cohort study	Services Lifespan issues	141	-
Happé & Frith (2020)	Looking back to look forward – changes in the concept of autism and implications for future research.	Review	Services, Diagnosis Lifespan issues	-	-
Hassan et al. (2022)	Health research in the Arab region in response to the COVID-19 pandemic	Scoping review	Services Risk factors	-	102
Ibrahim (2018)	Arab Spring's effect on scientific productivity and research performance in Arab countries.	Scoping review	Risk factors Biology, Services Lifespan issues Diagnosis	-	10291 7
Lord et al. (2019).	Autism spectrum disorder	Scoping review	Treatment and interventions Services Risk factors	-	-
Mahmood (2017)	Correlation between perception-based journal rankings and the journal impact factor (JIF)	A systematic review and Meta-analysis	n/a	-	-
Morales-	Prevalence and	Cross-	Diagnosis	5555	-

Hidalgo et al. (2018).	characteristics of autism spectrum disorder among Spanish school-age children	sectional study	Services Lifespan issues		
Oneib et al. (2022).	The sociodemographic and clinical profile of children with an autism spectrum disorder in the oriental region of Morocco	Cohort study	Lifespan issues Diagnosis Services	130	-
Opoku et al. (2022).	Accessibility of nutritional services for children with an autism spectrum disorder in the United Arab Emirates: Insights from special education teachers and parents.	Cross-sectional study	Services Lifespan issues	21	-
Parmeggiani et al. (2019)	Early features of autism spectrum disorder	Cross-sectional study	Diagnosis	105	-
Paulus et al. (2018).	The impact factor fallacy	n/a	n/a	-	-
Qoronfleh (2019)	Autism in the Gulf States a Regional Overview	Scoping review	Lifespan issues Service Diagnosis Treatment and interventions	-	-
Richa et al.	Estimating the	Cross-	Diagnosis	818	

(2020)	prevalence of autism spectrum disorder in Lebanon	sectional study	Services Lifespan issues Intervention s		
Smith & Dale (2016)	Integrating animals in the classroom: The attitudes and experiences of Australian school teachers toward animal-assisted interventions for children with autism spectrum disorder.	Cross-sectional study	Services Intervention s and treatment Lifespan issues	76	-
Sweileh et al. (2016)	Bibliometric profile of the global scientific research on autism spectrum disorders.	Systematic review	Lifespan issues Services		18490
Taha & Hussein (2014)	Autism spectrum disorders in developing countries: Lessons from the Arab World.	Scoping review	Lifespan issues Diagnosis Biology	-	-
Wetherston et al. (2017).	Views and knowledge of parents of children with autism spectrum disorder on a range of treatments.	Cross-sectional study	Lifespan issues Service, Diagnosis Biology	46	-

Table 3*Databases and Number of Research Articles*

Databases	Number of Research Articles
Web of Science.	4
EBSCOhost	5
PubMed	7
WHO Library	6
Total	22

ASD Research in Arab World Growth Rate

ASD research in Arab countries has grown significantly over the last eight years. On average, there are approximately 22 studies published related to ASD in the Arab world each year. More studies in this field were published in more recent years between 2020-2022 (91%), than in the preceding years (9%).

Aspects of ASD Researched

This review revealed that ASD research in Arab countries is mostly focused on risk factors (25%), life span issues (23%), and services (20%). Little attention is paid to biology (16%), interventions and treatments (13%), and diagnosis (9%). Over time, publications on ASD biology and diagnosis showed a rapid decline, while risk factors, lifespan issues, and services have increased significantly over the 8 year period examined.

Countries Where the Research Was Conducted

ASD research was reported to be conducted in 15 countries. Saudi Arabia had the most studies (n = 67), followed by Egypt (n = 25), United Arab Emirates (n = 29), and Oman (n = 20). Seven countries had only one study, while the remaining had between two or three studies.

Effects of ASD Research Publications

The average JIF for ASD studies in Arab countries was 5.1. Most studies published between 2014 and 2022 had the highest JIF factors. Seventy three studies had JIF above 7.0, while 19 had JIF below 2.0, with most published in 2022.

Discussion

General Findings

This review's primary purpose was to examine ASD research in Arab countries. It yielded a total of 172 studies published in this region between February 2014 and December 2022. Although the Arab world has 22 countries, these research publications were identified as being conducted in 15 countries. Annually, the average number of country-specific studies was 22 publications, with most of the research produced by Saudi Arabia, the United Emirates, Egypt, and Oman. Research publications in the Arab world have had a considerable impact, indicated by an average JIF of 5.1. Most of the studies had a JIF factor greater or equal to 7.0. Generally, ASD research in Arab countries has been active over the last decade, as indicated by the high number of research publications and researchers' engagement with existing publications.

The average number of ASD research publications has been growing over the study period, 2014-2022, with the greatest growth recorded in the past three years. The majority were published between 2020 and 2022. Compared to a previous review by Alnermary et al. (2017), this review shows ASD publications in Arab countries have more than doubled. The former identified 142 publications over 23 years, while the current review identified 172 studies over a period of eight years. The rapid increase in ASD research publications in recent years is influenced mostly by the Covid-19 outbreak (Hassan et al., 2020). The pandemic drew researchers' and various stakeholders' attention to mental health issues, including ASD. Additionally, some countries, such as the United Emirates, have invested significantly in ASD research in the last decades, significantly contributing to the publications in this area (Opoku et al., 2022). Given the recent trends and growing interest in

ASD research, more publications are expected in the Arab world.

The reviewed studies on ASD covered a wide range of topics, while some important areas were barely covered. Risk factors, lifespan issues, and available supports and services in Arab countries dominate ASD research, while the biology of ASD, intervention, treatment, and diagnosis was lightly researched. By contrast, Arab countries' ASD

research mainly focused on diagnosis, biology, and risk factors before 2014 (Alnemaary et al., 2017). The significant shift in the areas of ASD research demonstrates that Arab countries are more active in bridging gaps in knowledge on autism spectrum disorders (Richa et al., 2020). Research across countries on ASD address the same aspects as those covered in the research in Arab countries (Christensen & Zubler, 2020). Researchers in this region and worldwide are expanding their focus beyond the etiology of ASD to examine how the condition affects society and how it can be treated (Wetherston et al., 2017). Although research on risk factors, lifespan issues, and access to services is time-consuming, ASD research in the Arab world has evolved significantly, mostly by building on past research. However, a significant gap in the literature still exists regarding evidence-based practices and strategies related to ASD (Smith & Dale, 2016). Comprehensive research is crucial to fully understanding ASD in Arab countries.

The rate at which ASD research publications were cited to inform subsequent articles shows a rapidly growing trend in Arab world-based studies. Research articles published between 2014 and 2022 are cited approximately five times on average. Compared to the findings of the last review by Alnemaary et al. (2017), ASD research has almost doubled in JIF, indicating a rapid evolution. Although similar trends are evident in the global research on autism, Arab countries have a relatively lower JIF than Western countries (Sweileh et al., 2016). Unlike the Arab countries, ASD research in Western countries is well established. JIF as a measure of publications' impact is undermined by the large margin of error in calculation and other inefficiencies (Paulus et al., 2018). However, it is an essential evaluative tool, which indicates in the Arab world, there has been a major evolution in ASD research.

Barriers to Autism Research in Arab Countries

"Barriers to Autism Research in Arab Countries" covers the following Arab countries: Algeria, Bahrain, Comoro Islands, Djibouti Egypt, Iraq, Jordan, Kuwait Lebanon Libya, Morocco, Mauritania Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan Syria, Tunisia, The UAE, Yemen.

ASD research in the Arab world still lags behind Western and other developed regions. This gap in research is attributed to multiple factors. One of the main factors undermining ASD research in this region is insufficient resources in this field (Taha & Hussein, 2014). The existing research in these countries is produced by a few countries, most of which are high-income countries. Most countries in the Arab world are developing and lack sufficient resources to finance the infrastructure, staff, and administration necessary for ASD research. The language barrier is another factor inhibiting ASD research in Arab countries. Publications in the Arab region are mainly produced in English, Arabic, and French, but only studies published in English are recognized in the international ASD research community (Ibrahim, 2018). Such barriers inhibit the evolution of research in this area.

Limitations

This review is subject to various limitations. One of the main limitations of this review is that it does not fully represent ASD research in Arab countries. It does not consider ASD research publications published in French and Arabic, the region's main languages. Also, publications such as books, grey literature, and conferences publication, which are also used to publish research findings, are omitted in this review. However, it provides essential insights into the current status of ASD research in this region.

Conclusion

ASD research in Arab countries has evolved considerably since 2014. While some Arab countries have made significant progress in ASD research, this area is yet to be covered in others. Most ASD research publications are derived from a few countries, mostly developed Arab nations. Over the last eight years, research on the disorder has mostly focused on lifespan issues, services for individuals with ASD, and risk factors. The stakeholders in the Arab countries, especially government and private agencies responsible for advancing ASD research, should focus on epidemiological studies as they provide essential insights for informing policies and strategic planning.

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