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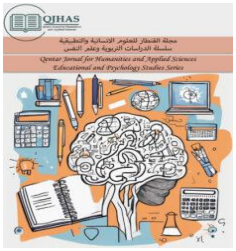

المؤتمر الثقافي الدولي الثاني للمعرفة الإنسانية

المسار الثقافي المعرفي: الواقع والتطلعات

Modern medicine Trends in Oman to Identify the causes of Autism Spectrum Disorder and its Treatment Interventions

توجه الطب الحديث في عُمان لمعرفه أسباب اضطراب طيف التوحد وطرق علاجه

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Abstract: The research paper aimed to identify the causes of autism spectrum disorder (ASD) and its treatment interventions among children aged 3 to 18 years in the Sultanate of Oman and the Gulf Cooperation Council (GCC) countries. To achieve this goal, PRISMA guidelines were followed to conduct a systematic search of PubMed, Scopus, and Web of Science databases. 230 records were identified, and 20 studies were selected after screening, and quality assessment using CASP checklists. The most prominent findings showed that prevalence rates ranged from 1.4 to 29 cases per 10,000 children in the GCC countries. There were also birth-related risks, such as cesarean delivery, with limited data on environmental factors. Applied behavior analysis and educational interventions were effective, but cultural stigma and resource disparities were barriers to implementation.

Key Words: Autism Spectrum Disorder; Oman, GCC; etiology; interventions; prevalence

الملخص: هدفت الورقة البحثية إلى تعرف أسباب اضطراب طيف التوحد، (ASD) والتدخلات المتبعة لعلاجه بين الأطفال الذين تتراوح أعمارهم بين 3 إلى 18 عامًا في سلطنة عمان ودول مجلس

التعاون الخليجي، ولتحقيق الهدف تم اتباع إرشادات PRISMA لإجراء بحث منهجي في قواعد بيانات PubMed وScopus و Web of Science ، وتم تحديد 230 سجلًا، واختيرت 20 دراسة بعد الفحص وتقييم الجودة باستخدام قوائم التحقق من (CASP). وأظهرت أبرز النتائج أن معدلات الانتشار تراوحت بين 1.4 إلى 29 حالة لكل 10,000 طفل في دول مجلس التعاون الخليجي، وأن هناك مخاطر متعلقة بالولادة مثل: الولادة القيصرية، مع وجود بيانات محدودة عن العوامل البيئية، وتبين فاعلية نتائج تحليل السلوك التطبيقي والتدخلات التعليمية ، إلا أن التوجهات الثقافية والفوارق في الموارد شكّلت عوائق أمام التطبيق.

الكلمات المفتاحية: اضطراب طيف التوحد. المسببات. التدخلات.الانتشار

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental condition characterized by persistent challenges in social interaction, communication, and restricted or repetitive behaviors (1). These difficulties often limit participation in social and educational activities, which are critical for enhancing emotional and psychological well-being in children and adolescents (2). Children with ASD engage less frequently in such activities compared to their typically developing peers, yet their perspectives remain underexplored (3). In the Gulf Cooperation Council (GCC) region, including Oman, Bahrain, Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates, ASD research is emerging but limited, with inconsistent prevalence estimates and a focus on etiology (4). For example, prevalence in Oman ranges from 1.4 per 10,000 (5) to 20 per 10,000 (6), while the United Arab Emirates reports up to 29 per 10,000 for pervasive developmental disorders (4).

These variations stem from differences in diagnostic criteria and screening tools (7). ASD etiology is multifactorial, involving genetic, prenatal, and environmental factors (8), with cultural

factors like stigma delaying diagnosis in the GCC (9). This systematic literature review aims to evaluate the causes and treatment methods of ASD among children aged 3–18 in Oman compared to other GCC countries, identifying research gaps to guide future studies**.**

Methodology .1

This systematic literature review adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (10). The study was guided by a PICO framework to structure the research question:

- Population: Children aged 3–18 years diagnosed with ASD in Oman and GCC countries (Bahrain, Kuwait, Qatar, Saudi Arabia, United Arab Emirates).
- Intervention: Etiological factors (genetic, obstetric, environmental) and treatment methods (behavioral, educational, pharmacological, community-based).
- Comparison: Differences in etiology and interventions between Oman and other GCC countries.
- Outcome: Prevalence estimates, risk factor identification, and treatment effectiveness.

Searches were conducted in PubMed, Scopus, and Web of Science for studies published from January 2005 to April 2025. Search terms included "autism spectrum disorder," "autism," "Oman," "Gulf Cooperation Council," "Bahrain," "Kuwait," "Qatar," "Saudi Arabia," "United Arab Emirates," "causes," "etiology," "treatment," "intervention," "prevalence," and "genetic," combined using Boolean operators (AND, OR). A sample PubMed search string was: ("autism spectrum disorder" OR autism) AND (Oman OR "Gulf Cooperation Council" OR

Bahrain OR Kuwait OR Qatar OR "Saudi Arabia" OR "United Arab Emirates") AND (causes OR etiology OR treatment OR intervention OR prevalence OR genetic). Grey literature was searched via Google Scholar (first 100 results), and reference lists of included studies were hand-searched (11). Full search strategies are provided in Appendix A.

Inclusion Criteria:

Peer-reviewed original research articles in English.

- Studies on children aged 3–18 years with ASD.
- Research conducted in Oman or GCC countries.
- Studies addressing ASD prevalence, causes, or treatment methods.
- Quantitative, qualitative, or mixed-methods studies with primary data.

Exclusion Criteria:

- Non-peer-reviewed sources (e.g., editorials, conference abstracts).
- Studies not in English.
- Research outside the 3–18 age range or GCC region.
- Studies without primary data or clear methodology.

Records (n=230) were identified from databases and additional sources. After removing duplicates (n=205), two reviewers independently screened titles and abstracts, with 90% inter-rater agreement (Cohen's $\kappa = 0.82$). Full-text articles (n=60) were assessed, with 40 excluded for irrelevance (n=18), wrong age group (n=12), or no primary data (n=10). Twenty studies were

included in the qualitative synthesis (10). The PRISMA flow diagram is presented in Figure 1.

Two reviewers extracted data using a standardized form, including study design, sample size, location, ASD prevalence, causes, treatment methods, and outcomes. The Critical Appraisal Skills Programme (CASP) checklists for cohort studies, case-control studies, and randomized controlled trials were used to assess quality (12). Studies were rated as high (≥80% CASP criteria), moderate (50–79%), or low quality (<50%), with 85% inter-rater agreement.

Table 1:The identification and screening process for records related to the study of Autism Spectrum Disorder (ASD) can be summarized in the following table:

Phase	Records
Identification	230
- Databases (PubMed, Scopus, Web of Science)	n=220
- Other sources (grey literature, hand-searching)	n=10
Records after duplicates removed	205
Screening	
- Records screened (title/abstract)	205
- Records excluded	145
Eligibility	

Phase	Records
- Full-text articles assessed for eligibility	60
- Full-text articles excluded	40
- Not relevant to ASD etiology/treatment	n=18
- Wrong age group (outside 3–18 years)	n=12
- No primary data	n=10
Included	20

The initial identification phase resulted in a total of 230 records, of which 220 were sourced from major databases like PubMed, Scopus, and Web of Science, while 10 came from grey literature and hand searches. After removing duplicates, 205 unique records remained for screening. During the screening process, 145 records were excluded based on the criteria of relevance and appropriateness for the targeted age group of 3-18 years.

In the eligibility phase, 60 full-text articles were assessed, leading to the exclusion of 40 articles. The reasons for exclusion included 18 articles deemed not relevant to ASD etiology or treatment, 12 articles that focused on individuals outside the defined age group, and 10 articles that lacked primary data needed for synthesis. Ultimately, 20 studies were included in the qualitative synthesis of this research on ASD

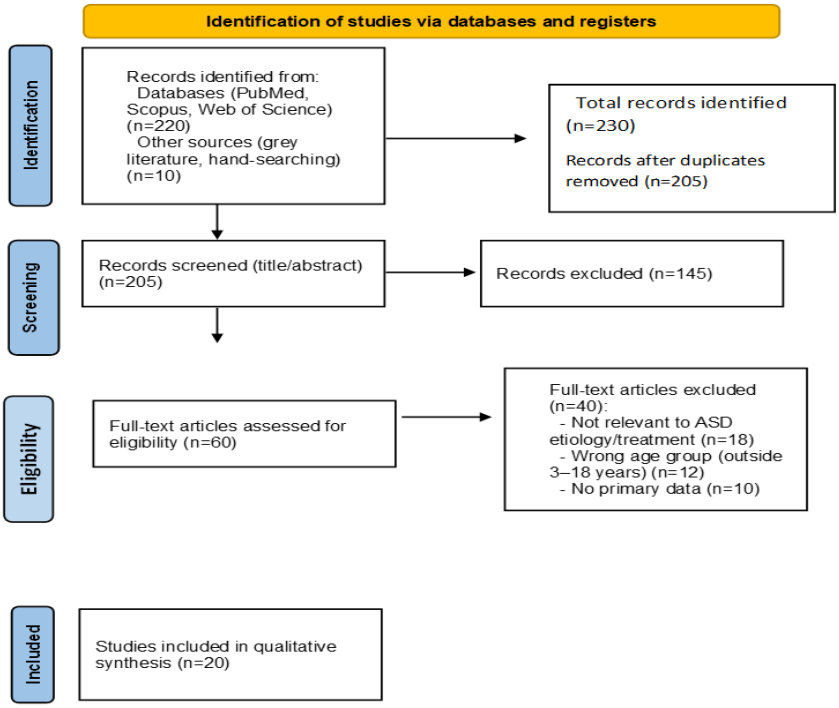

Figure 1. PRISMA Flow Diagram of Study Selection for ASD in Oman and the GCC

Results:

This section synthesizes findings from 20 studies included in the qualitative synthesis, focusing on ASD prevalence, causes, and treatment methods among children aged 3–18 in Oman and other GCC countries.

1. Prevalence of ASD

Prevalence estimates varied across GCC countries due to differences in diagnostic tools and study designs. In Oman, Al-Farsi et al. (5) reported a prevalence of 1.4 per 10,000 children,

while Eapen et al. (6) estimated up to 20 per 10,000 in the region. In the UAE, Salhia et al. (4) documented a prevalence of 29 per 10,000 for pervasive developmental disorders. Kuwait and Saudi Arabia showed lower estimates, ranging from 1.1 to 5 per 10,000 (13).

2. Causes of ASD

ASD etiology in the GCC is multifactorial, with genetic, obstetric, and environmental factors identified. Genetic studies in Oman identified variants in CNTNAP2 and SHANK3, with consanguinity increasing risk (14). Alabdali et al. (15) reported higher familial clustering in Saudi Arabia linked to consanguineous marriages. In Bahrain, Al-Ansari and Ahmed (16) found an association between cesarean section deliveries and ASD (odds ratio [OR] = 1.8, 95% CI: 1.2–2.7), alongside maternal gestational diabetes. Paternal age over 40 years was a risk factor in Qatar (17). Limited GCC-specific data exist on environmental influences, though global evidence suggests prenatal air pollution exposure may contribute (8).

3. Treatment Methods

Treatment approaches in the GCC vary in implementation and evaluation. Applied Behavior Analysis (ABA) was widely used in Oman and the UAE, with Alnemary et al. (13) reporting improved social skills in 70% of treated children (n=150). Early intervention programs showed moderate effect sizes (Cohen's d = 0.6) in Saudi Arabia (18). In Oman, Al-Mamari et al. (19) noted dietary interventions improved nutritional status but had limited impact on core symptoms. Individualized Education Programs (IEPs) in Qatar and Oman showed mixed outcomes due to variable teacher training (20), while Saudi Arabia reported better results with structured IEPs (13). Risperidone use was documented in

Saudi Arabia for behavioral symptoms, though Almandil et al. (21) highlighted side effect concerns. Community-based programs in Oman improved parental coping and child engagement (22).

Discussion

The 20 studies reviewed highlight ASD's multifactorial etiology in the GCC, with genetic predisposition, obstetric complications, and potential environmental influences (8). Prevalence variability reflects inconsistent diagnostic criteria and screening practices (4). Al-Farsi et al. (5) suggest Oman's lower prevalence (1.4 per 10,000) may underestimate the true burden, while Eapen et al. (6) align higher rates with global trends.

Treatment efficacy, particularly ABA and educational interventions, is promising but limited by resource disparities and cultural factors (13). Alnemary et al. (13) noted ABA's success depends on early access, uneven across rural and urban areas. Cultural stigma delays diagnosis, especially in Saudi Arabia and Oman (9), where family-centered approaches are emerging (22). The absence of longitudinal studies hinders outcome assessment, a gap noted in similar contexts (7).

Compared to global research, GCC studies lack environmental risk data (8), with hospital-based samples introducing bias (15). Future research should prioritize population-based studies (5), environmental assessments (8), culturally tailored interventions (9), and standardized diagnostics (7).

Strengths and Limitations:

The review's strengths include a comprehensive search across databases and diverse study designs (10). Limitations include methodological heterogeneity, limited environmental data,

and exclusion of non-English studies, potentially missing regional insights (9).

Recommendations:

Future studies should conduct population-based epidemiological research (5), investigate environmental risks (8), develop culturally tailored interventions (9), and standardize diagnostic practices (7).

Conclusion:

This SLR synthesizes evidence from 20 studies, identifying genetic, obstetric, and potential environmental factors in ASD etiology among children aged 3–18 in Oman and the GCC. Behavioral and educational interventions are effective but constrained by resources and cultural barriers. Standardized research and culturally sensitive strategies are crucial for improving outcomes.

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