

Awareness about Autism among Primary Healthcare Providers in Oman: A Cross-Sectional Study

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Abstract

Background: Many developing countries such as Oman are marred with the rising tide of children with autism and the lack of specialized services for these children. Within existing compartmentalized and centralized health care organizations, the general practitioners (GPs) are likely to serve as the first level of contact relevant for diagnosis and referral for remedial services. This study aims to explore the awareness of autism among GPs in Oman on issue pertinent to etiology, signs and symptoms, perceived correlates, as well as the consequence of having autism. Related to this is to examine whether years of medical practice would invariably influence GPs' awareness.

Methods: This cross-sectional study was conducted among GPs (n=113) working at primary healthcare centers (PHC) during September 2013 to February 2014 in Muscat, the capital of Oman.

Results: The GPs appear to have suboptimal awareness of etiological factors relevant for the development of autism, its common signs and symptoms, perceived correlates, as well as the social dimension. Number of years in practice has little bearing on awareness.

Conclusion: Empirical evidence has unequivocally indicated that although there is no known 'cure' for autism, early identification and early intervention tend to better the quality of life for children with autism. This means GPs in Oman should be fitted with adequate awareness of such population.

Keywords: Primary healthcare, General practitioner, awareness, autism, ASD, Oman

Abbreviations

GP: General practitioner

ASD: Autism spectrum disorder

PHC: Primary healthcare center

SPSS: Statistical Package for Social Sciences

1. Background

Autism and its spectrum constitute a serious, lifelong condition that challenges children's normal development, which adversely affected their quality of living. Also, autism and its spectrum manifest as social deficit, communication impediment as well as stereotypical and idiosyncratic behavior and mannerism. Over the past decade, the prevalence of autism has quadrupled to the extent that the recent epidemiological survey has indicated an increase of 200% (Kopetz & Endowed, 2012). Although autism is generally impervious available medical

intervention (Volkmar et al., 2004; Gillberg, 1990; Mohiuddin & Ghaziuddin, 2013), there is growing evidence indicating the benefits of intervening at a younger age. Early intervention has been indicated to mitigate associated impairments and disability, and to heighten the quality of life and facilitate functional independence (Mitchell & Holdt, 2014; Nair et al., 2014; Gulsrud et al., 2014; Feinberg et al., 2014; Lahav et al., 2013).

With the promising benefits of early intervention, remedial and education intervention is increasingly being recognized as pivotal for triggering meaningful existence. Thus, awareness of those who have direct bearing on their early intervention program comes to the forefront such as healthcare professionals. Awareness among those involved in the welfare of such children would enable them to be vigilant on earlier detection and referral to bodies that oversee remedial and educational intervention.

Healthcare professionals' awareness of autism has been investigated in various parts of the world (Barbaro et al., 2011; Imran et al., 2011; Strunk, 2009; Bakare et al 2009; Stone et al., 1994). These studies have indicated that healthcare professionals tend to harbor sub-optimal awareness. For example, an early survey by Stone *et al* (1994) showed a variation of accuracy of knowledge regarding autism and its manifestations among professionals in different disciplines. A study in Sub-Saharan African subcultures also highlighted a number of misconceptions regarding etiology, treatment and prognosis of Autism spectrum disorders among health care workers (Bakare et al 2009). Another study in Africa identified a deficit of knowledge among pediatric and psychiatric nurses on childhood autism (Igwe et al., 2011). In addition, a study in Pakistan by has indicated lack of understanding of diagnostic features of autism among healthcare workers (Imran et al., 2011). With such background, concerted efforts are needed to eradicate the lack of awareness among healthcare workers. While poor awareness towards children with autism has been reported in many parts of the world, such information is still ostensibly absent from Arab/Islamic population. In order to fill the gap in the existing literature, this study aims to examine the awareness about autism among primary health care providers in Oman. Al-Farsi et al. (2011) surveyed the magnitude of autism in Oman and reported that 0.14/1,000 Omani children (aged 0-14 years) fulfill the criteria for autism. This seemingly low prevalence rate is more likely to stem from under-diagnosis and under-reporting of ASD in the country. Thus, such figure may be a 'tip of the iceberg'. Out of 230 countries, Oman has ranked 48th in the global population growth rate with the demographic profile characterized by a preponderance of youthful population structure as 83% of the population are under the age of 20 (Al-Sinawi et al., 2012). In an increasing population, the number of people afflicted with neurodevelopmental disorders such as autism is likely to increase. Therefore, prompt detection and early intervention would be imperative.

With such a background, this study aims to explore the awareness of healthcare practitioners in Oman about autism. An integral part of such a quest is to examine whether the number of years in practice would have a direct bearing on the level of awareness. The specific aim of this study is to solicit awareness of General Practitioners (GPs) on the etiology, signs and symptoms, perceived correlates, as well as the consequence of having autism.

2. Methods

This cross-sectional study was conducted among GPs working at primary healthcare centers (PHC) during September 2013 to February 2014 in Muscat, the capital of Oman. Allowing an error rate of 2.5%, the level of significance (type 1 error) of 1%, and 99% confidence interval; and with a priori estimate that 40% of GPs would have high awareness about ASD, the computer program indicated that a sample size of 100 participants was required to achieve the objectives of our study.

Using the administrative structure of primary healthcare centers in Muscat Governorate, a multi-stage stratified sampling design was developed over three levels: *wilayat* (district), PHC, and GPs. A total of 15 PHCs comprising a total of 314 GPs were identified in the Governorate. The list of PHCs and GPs were assigned digits randomly. Using the Statistical Package for Social Sciences (SPSS) software (Version 19.0, IBM, Chicago, Illinois, USA), the participants were selected in two stages: First, a sample of 6 PHCs was randomly selected from the list, then from among the GPs working in those randomly selected schools, a random sample of 130 GPs was selected. From the 130 GPs approached 125 (96%), expressed consent to participate in this study. The questionnaires were distributed by trained residents who utilized the time to explain the importance of the study, and motivated the participants, which resulted in obtaining a high response rate. A total of 12 eligible participants were excluded from the study due to incompletely filled questionnaires, or no response probably due to lack of time. Responses were therefore obtained from 87% of the original sample.

A questionnaire was adopted and modified from previous studies (Imran et al., 2011; Rahbar et al., 2011; Lian et al., 2003). The tool and criteria for knowledge and attitude towards autism were defined and developed as reported elsewhere (Rahbar et al., 2011; Al-Sharbati et al., 2012; Al-Sharbati et al., 2015). The questionnaire covered GPs' awareness about the etiology, signs and symptoms of autism, as well as items on socio-demographic factors and

healthcare needs of children with ASD.

For the purpose of validation, the instrument was targeted towards bilingual GPs since they have the ability to give feedbacks about both the English and Arabic content of the instrument. The English and Arabic versions of the questionnaire were formatted. To improve its conceptual content, a standard forward-backward procedure was applied to translate the English version into Arabic and vice versa. A bilingual professional who was independent from the team of investigators checked the translated Arabic version of the questionnaire.

The questionnaire was piloted on 20 randomly selected GPs, and then later validated internally. The validity of the questionnaire was assessed by the comparison of the information obtained through self-filled questionnaire versus questionnaire filled during the interview. The information gathered during the interview was considered the standard for comparison. Construct validity was assessed using Spearman correlations over an overall number of correct answers related to concept of awareness ($r= 0.88$, $P < 0.01$), which showed high significant correlation, supporting the very good construct validity. Inter-rater reliability was established among interviewers to standards of 90% agreement on questions related to etiology, signs and symptoms, and social-demographic correlates of autism. The overall percentage agreement between the raters on the selected parameters (test-retest reliability) was found to be 89% ($\kappa= 0.91$). Therefore, the global psychometric assessment of the questionnaire indicated that the overall reliability and validity were both high.

Chi-square analyses were used to evaluate the statistical significance of differences among proportions of categorical data. The non-parametric Fisher's exact test (two-tailed), instead of the Chi-square test was used for small sample sizes, where the expected frequency was less than 5 in any of the 2x2 table cells. All statistical analyses were performed using the SPSS software; a cutoff p-value of < 0.05 was the threshold of statistical significance for all tests. The study has been approved by the Medical Research Ethics Committee in the College of Medicine and Health Sciences, Sultan Qaboos University (SR/MED/FMCO/11/01).

3. Results

One hundred and fourteen questionnaires were distributed to health centers in Muscat governorate. A total of 113 participants were included in the analysis, where (75%) were Omani doctors and (25%) were from different nationalities. Most of the participating GPs had an experience of 5 years or less and were from a younger age group (25-30 years old). The GPs who had more than 5-years experience were mostly from (36-40) age group. About 31% of GPs had practiced medicine outside Oman, 11% were family medicine specialists with (Member of the Royal College of General Practitioners) MRCGP qualification and about 26% were family medicine residents. The majority of the samples did their undergraduate and graduate medical education in Oman with about 76% and 68% respectively. Most of the GPs (89%) had reported that they had heard about autism, particularly from medical schools (63%), medical literature (30%), media (26%) and other sources (2%). About half of the participants had seen autism cases in Oman; equally about 50% reported that they had seen children with autism after graduation. Moreover, almost 7% of the GPs reported having cases of autism in their families (Table 1).

Table 2 shows the knowledge that GPs had about autism etiology. About 39% of the participating GPs correctly endorsed the view that autism stem from being a neurologic factor and approximately 59% indicated neurogenetic determinism of autism. Around 3% of our sample wrongly attributed certain types of food could cause autism, while 11% wrongly thought immunization such as MMR to be a causative factor of autism. In addition, about 22% wrongly thought that negligence in parenting causes autism. It cumulative experiences (<5 vs >5 after qualification) have little bearing on the knowledge on the causes of autism. Finally, on etiology, the approximately 13% of the participants attributed lack of religiosity to be associated with giving birth of a child with autism.

Table 3 shows the GPs' knowledge about autism signs and symptoms. About 59% of GPs correctly agreed that children with autism tend to favor certain types of food, and that there was a significant difference between GPs who graduated within the <5 years and GPs who had completed >5 years since graduation. Furthermore, about 79% correctly agreed that autistic patients have developmental problems in speech, and 23% of GPs wrongly considered repeated movements of hand and head as unimportant diagnostic criteria. Less than 2% wrongly reported that children with autism have affinity to social interaction, and about 47% wrongly considered body language and symbolic communication as one of the signs and symptoms of autism. Additionally, about 31% wrongly endorse the view that creativity in play is an important diagnostic sign of autism. Approximately, 37% did not think that children are with average intelligence. Eight percent of the GPs are having wrong held view that people with autism can maintain eye contact. About 56% of the participants correctly stated that there is a detachment issue with people with autism while lack of affection was endorsed in about 33%. Finally, about 83% correctly equated hearing impairment and mental retardation as one of the signs and symptoms for diagnosing autism. About 14% reported that autism causes the development of schizophrenia while 10% of the participants

wrongly endorsed the view that schizophrenia and autism are not orthogonal conditions.

Table 4 shows indicators of GPs' awareness on some of the correlates of autism. About 23% of GPs could not state the age when autism is manifested and thus diagnosable. This view was significantly different in terms of the number of years in practice. Around 16% wrongly assumed that modern medical science is equipped to prevent development of autism while about 12% reported that autism is curable. About half of the participants correctly endorse the view that there is inherent gender difference in autism. Also, about half of the participants wrongly assume that autism can be diagnosed with a high level of accuracy. About 35% and 23% of GPs wrongly endorsed the statements that "autism is more prevalent in higher socioeconomic classes", and "Autism is prevalent in higher educational classes." respectively. About 32% wrongly agreed with the statement "with added maturity, most children tend to outgrow their autistic features".

Table 5 solicited perceived consequences of having a child with autism. About 56% of GPs believed that autistic children should be enrolled in mainstream education, and about 62% reported that autism holds social stigma in the community. About 41% thought that a diagnosis of autism in children would lead to them being treated differently, and about 66% reported that there are negative opinions regarding autistic children.

Table 1. General characteristics of the participated general practitioners by number of years after graduation, Oman, 2014

Characteristics	Total	Graduated ≤5 y	Graduated >5 y	P value
	(N=113)	(N=65)	(N=48)	
	N (%)	N (%)	N (%)	
Nationality				<0.01
Omani	85 (75)	23 (48)	85 (75)	
Non-Omani	28 (25)	25 (52)	28 (25)	
Age				<0.01
≤30	61 (54)	58 (89)	3 (6)	
>30	52 (46)	7 (11)	45 (94)	
Trained in Family Medicine				0.18
No	72 (64)	38 (58)	34 (71)	
Yes	41 (36)	27 (42)	14 (29)	
Medical Degree				<0.01
Oman	78 (69)	57 (88)	21 (44)	
Other	35 (31)	8 (12)	27 (56)	
ASD Knowledge				<0.01
Medical School	71 (63)	48 (74)	23 (48)	
Media & Journals	42 (37)	17 (26)	25 (52)	
Medical School				<0.01
Private	21 (19)	19 (29)	2 (4)	
Public	92 (81)	46 (71)	46 (96)	
Heard about ASD	100 (88.5)	58 (89.2)	42 (87.5)	0.86
Practice outside Oman	35 (31)	14 (21.5)	21 (43.6)	0.03
Seen ASD in Oman	61 (54)	31 (47.7)	30 (62.5)	0.43
Relatives with ASD	8 (7.1)	5 (7.7)	3 (6.3)	1.00
Seen ASD post-graduation	56 (49.6)	25 (38.5)	31 (64.6)	<0.01

Table 2. Knowledge about autism etiology among general practitioners, Oman, 2014

Indicator	Total	Graduated ≤5 y	Graduated >5 y	P-value
	(N=113)	(N=65)	(N=48)	
	N (%)	N (%)	N (%)	
Autism has neurobiological origin	44 (38.9)	21 (32.3)	23 (47.9)	0.23
Heredity plays a major role in causing autism	67 (59.3)	35 (53.9)	32 (66.7)	0.19
Certain types of food can cause autism	7 (6.2)	2 (3.1)	5 (10.4)	0.18
Immunization contributes to causing autism	13 (11.5)	7 (10.8)	6 (12.5)	0.33
Autism is mostly attributed to parental negligence	26 (23.0)	14 (21.5)	12 (25.0)	0.82
Children with autism are often conceived by parents who are less devoted to religious practice	15 (13.3)	9 (13.9)	6 (12.5)	0.39

Table 3. Knowledge of Autism signs and symptoms among general practitioners, Oman, 2014

Indicator	Total	Graduated ≤5 y	Graduated >5 y	P-value
	(N=113)	(N=65)	(N=48)	
	N (%)	N (%)	N (%)	
Poor/absent speech development is a major symptom of autism	89 (78.8)	47 (72.3)	42 (87.5)	0.07
Repetitive movements of hands/head is not important in autism diagnosis	26 (23.0)	18 (27.7)	8 (16.7)	0.32
Preference of certain type of food and play is important for diagnosis of autism	67 (59.3)	44 (67.7)	23 (47.9)	0.02
Children /adolescents with autism likes social interaction	2 (1.8)	0 (0.0)	2 (4.2)	0.05
Patients with autism use body language and finger symbolic communications	53 (46.9)	32 (49.2)	21 (43.8)	0.04
Creative play is an important characteristic among people with autism	35 (31.0)	20 (30.8)	15 (31.3)	0.34
Majority of people with autism have average intelligence	42 (37.2)	26 (40.0)	16 (33.3)	0.40
Eye contact can be maintained with people with autism	9 (8.0)	5 (7.7)	4 (8.3)	0.92
Children with autism show detachment from their parents	63 (55.8)	35 (53.9)	28 (58.3)	0.45
Children with autism are not affectionate	37 (32.7)	22 (33.9)	15 (31.3)	0.38
Differential diagnosis of autism is hearing impairment and mental retardation	94 (83.2)	55 (84.6)	39 (81.3)	0.08
Autism is precursor for schizophrenia	16 (14.2)	6 (9.2)	10 (20.8)	0.11
It is hard to distinguish autism from schizophrenia	10 (8.9)	4 (6.2)	6 (12.5)	0.41
Autism can be diagnosed with high level of accuracy	54 (47.8)	27 (41.5)	27 (56.3)	0.24

Table 4. Perceived correlates of Autism among general practitioners by number of years after graduation, Oman, 2014

Indicator	Total	Graduated ≤5 y	Graduated >5 y	P-value
	(N=113)	(N=65)	(N=48)	
	N (%)	N (%)	N (%)	
Autism starts during school age(6-12 years old)	26 (23.0)	20 (30.8)	6 (12.5)	0.002
Males are more affected than females	62 (54.9)	30 (46.2)	32 (66.7)	0.09
Autism is more prevalent in higher socio-economic classes	40 (35.4)	24 (36.9)	16 (33.3)	0.88
Autism is prevalent in higher educational classes	26 (23.0)	18 (27.7)	8 (16.7)	0.20
With added maturity, most children tend to outgrow their autistic features	36 (31.9)	23 (35.4)	13 (27.1)	0.59
Autism is preventable	18 (15.9)	10 (15.4)	8 (16.7)	0.03
There are curable treatment for autism	13 (11.5)	7 (10.8)	6 (12.5)	0.06

Table 5. Perceived consequence of having Autism among general practitioners, Oman, 2014

Indicator	Total	Graduated ≤5 y	Graduated >5 y	P-value
	(N=113)	(N=65)	(N=48)	
	N (%)	N (%)	N (%)	
In your own opinion, should children with autism receive mainstream education?	63 (55.8)	36 (55.4)	27 (56.3)	0.94
Do you think autism holds a social stigma in this community?	70 (62.0)	44 (67.7)	26 (54.2)	0.28
Do you believe that diagnosis of a child with autism will lead to discrimination against the child?	46 (40.7)	27 (41.5)	19 (39.6)	0.59
In general there are negative opinion towards children diagnosed with autism	75 (66.4)	43 (66.2)	32 (66.7)	0.88

4. Discussion

On the health front, Oman also provides universal free health care for all its citizens. According to the world health report (World Health Organization, 2008), “Over 98% of births in Oman are attended by trained personnel, and over 98% of infants are fully immunized. Life expectancy at birth was less than 60 years, in the later part of the 1970s. Now, the figure has reached in around 74 years. Under-five mortality rate has dropped by a staggering 94%”. The improved standard of living in the last four decades has coincided with the ‘baby boom’ (Arab Human Development Report, 2009) and some challenges in safeguarding the welfare of children. There is strong indication that Oman is increasingly being gripped with the challenges of having increased number of children with disability (World Health Organization, 2009) including children with autism (Al-Farsi et al., 2011). Previous studies in Oman have indicated that most parents of these children with autism were dissatisfied with existing services for their children (Al-Farsi et al., 2013a). Similarly, another study indicated that the level of awareness of teachers towards children with autism appears to be sub-optimal (Al-Sharbati et al., 2015).

Oman, like other developing countries, has developed infrastructures for primary health care. The coverage for primary health care has spread to all corners of the country. Within the aforementioned points, this study has explored awareness of autism among primary health care doctors. This study has embarked to solicit awareness of GPs on the etiology, signs and symptoms, perceived correlates, as well as the consequence of having autism.

The first aim of this study was to explore GPs’ understanding of the potential causal factors of ASD. This is a seemingly interesting issue since there is a divergent view on etiological factors underpinning the development of ASD even among the experts. In the available literature, two paradigms seem to have dominance. The most prevalent current view is that genetic factors play a critical role in the genesis of ASD, but the available evidence is convoluted with many contradicting views about the specifics of this mechanism. One example is whether autism is due to rare mutation or due to common genetic variation (Abrahams & Geschwind, 2008; Buxbaum, 2009).

Another view falls largely under the umbrella of nature in which environmental factors play a role. This includes the now-discounted views that parents caused autism, often called the 'refrigerator mother' hypothesis (Kanner, 1943) and is concerned about the adverse effects of inoculation (Doja & Roberts, 2006). The role of heavy metals (Al-Farsi et al., 2012b; Hodgson et al., 2014), trace elements and dietary factors (Ali et al., 2011; Al-Farsi et al., 2012a; Al-Farsi et al., 2013b; Al-Farsi et al., 2013c) has also been implicated. While most of the discussions on 'nature vs. nurture' in the context of the disease are limited within the walls of academia, etiological factors linked to ASD have increasingly become public and the object of emotive public debate. The question remains on how such background would impact on GPs. There were six items examining knowledge about the cause of autism. Although it was not surprising that there was divergent views that autism has neurological and hereditary origin since such 'division' exist even among experts, it was disheartening to observe that there were some GPs in Oman, regardless of their diverse numbers of years in practice still endorse the view that certain food, immunization, and parental neglect trigger autism. What is more surprising is the view that healthcare providers still harbor the view that lack of religious practice could trigger autism. Such attribution has been previously noted in the general population (Bakare et al., 2009) but it is seemingly surprising that some GPs in Oman still harbor what mount to be 'medieval view' on factors that contribute to autism.

The second aim of this study is to solicit GPs' awareness about signs and symptoms pertinent to autism. On the whole, the GPs in Oman seem to lag behind in awareness relevant for identifying the signs and symptoms commonly observed in children with autism. As there is shortage of human resources relevant for behavioral and emotional children in the country (Al-Farsi et al., 2013a), Oman has been forefront in development of its primary healthcare services (Burjorjee & Adawi, 1992). A conscious effort has been made to 'deinstitutionalization' of mental health services into 'back to the community'. According to World Health Organization, officially approved manuals on the management and treatment of mental disorders are available in the majority of primary health care clinics (World Health Organization, 2011). Official referral procedures for referring persons from primary care to secondary/tertiary care exist as do referral procedures from tertiary/secondary to primary care". Within such system, primary health care practitioners are the first line of pathway to biomedical care. Thus, GPs are likely to furnish some of the issues of diagnosis of autism, a feat that has been documented elsewhere (World Health Organization, 2009; Barbaresi et al., 2006). However, this study indicates that GPs in present catchment area are ill-equipped to recognize the children with autism. It is possible that GPs in Oman do not get adequate 'refresher' courses on behavioral and cognitive problems in children (World Health Organization, 2008). According to one estimate, barely 6% tend to 'receive at least two days of refresher training' on endeavors under scrutiny (World Health Organization, 2011). This might explain the well-known trend that it is due to cultural practice that behavioral disturbance often become prerogative of traditional healing system (Hussein et al., 2012) which, in turn, substantiates the earlier observation that there is under-utilization of services among youngsters in Oman (Al Riyami et al., 2009).

The third aim of this study is to explore the perceived correlates of children with autism. It was surprising that significant number GPs thought that autism is a 'disease of the affluent'. The international epidemiological trend has indicated that autism appears to have a higher magnitude in the affluent countries of Western Europe and North America compared to non-industrialized countries. The 'North-South' division may be related to lack of expertise for diagnosis of such children (Newschaffer et al., 2007). While epidemiological survey has shown a preponderance of the higher rate in the rich countries of the Northern part of the world, there is no indication that within the country, socio-economic status has a bearing with the occurrence of autism (Pinborough-Zimmerman, 2011). It therefore appears that autism is in all strata of the society. Endorsement among GPs in Oman that autism tends to occur more in the upper class of the society constitute lack of awareness of issues pertinent to autism. The other issues that were presented operationalized as perceived correlates as it appears that autism is misunderstood by some GPs in Oman.

Finally, this study also examined the perceived consequences of having a child with autism. It appears that GPs harbor similar concern for the welfare of people with autism as previously observed among significant caregivers in Oman (Al-Farsi et al., 2013a). For example, the GPs indicated that mainstream education should be preferred to furnish educational needs of children with autism. GPs did admit that Oman society may harbor stigma towards children with autism and being culturally devalued condition, label of autism is likely to conjure discrimination.

There are a number of limitations to this study. The first limitation is related to the relatively small sample size that might have affected the generalizability of the study findings. The enrollment of the study participants has been based on stratified random sampling in order to ensure representativeness. The overall number of the enrollees is still considered low compared to the overall number of GPs working in Oman. The low sample size might also have affected the power of the study. Also, although the power analysis was conducted and the samples taken

exceeded the number expected to achieve the desired power level of the study, there is still a chance that the study was underpowered. It is still unclear whether such a group is representative of the situation in the entire country. The generalization of this study might also be hampered by the fact that the study did not include GPs from the private clinics.

Another limitation is that the indices of awareness articulated in this study were subjectively reported. Most importantly, there is little evidence suggesting that attitudes translate into action. In such cases, it is difficult to predict whether their awareness or attitude would translate into behavior. On the other hand, it is possible that GPs responded with what they perceived as favorable answers, so they would avoid giving an overall impression that their awareness was low. More studies to rule out such confounding factors are essential. Therefore, there is a need for large-size future studies equipped with better-standardized training techniques reaching a broader range of GPs.

The third possible limitation was that the questionnaire presented a list upon which the respondents were asked to comment. This approach may have encouraged them to answer affirmatively when they were not sure about a particular item, as explained elsewhere (Groves et al., 2009). It might have been a better approach if respondents were asked to enumerate signs and symptoms that they would use in detecting autism.

In conclusion, the study findings revealed that the knowledge about autism is low among GPs in Oman. Suboptimal awareness among GPs, who are likely to be first in contact with the children with autism's pathway to care, is likely to have negative implication for such children. Empirical evidence has unequivocally shown that although there is no 'cure' for autism, early identification and early intervention tend to improve the quality of life for children with autism. Steps should be taken to increase their awareness towards autism in Oman, by enriching college and university curricula with special education for the students. Also, educational programs (via lectures, workshops, courses) are urgently needed to improve the awareness in GPs.

Authors' Contributions

MAS formulated the study concept and contributed to the development of instrument and write up of the study. KA, JH, and MFT collected the data and contributed to data analysis, literature review, and write-up of the manuscript. YF and MMS conceptualized the methods and contributed in reviewing results and write-up of the manuscript. YF, MMS, and SA revised the scientific background of the study and contributed to the literature review and write-up of manuscript, especially the Discussion. All authors read and approved the final manuscript.

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Competing Interests Statement

The authors declare that there is no conflict of interests regarding the publication of this paper.

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