

Research Article

Knowledge and Awareness of Autism Spectrum Disorder among Paediatricians and Primary Healthcare Professionals in Singapore

Sharline SUHUMARAN¹, Geraldyn LEONG Kit Ying², Chui Mae WONG¹

Author's Affiliation:

1- Department of Child Development, KK Women's and Children's Hospital, Singapore.
2- NUS Yong Loo Lin School of Medicine, Singapore

Correspondence:

Sharline Suhumaran, Email: sharline.suhumaran@singhealth.com.sg

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ABSTRACT

Background Autism Spectrum Disorder (ASD) is the leading cause of disease burden in children between ages 0 and 14 years in Singapore. Early identification and intervention confers a better prognosis. This study aims to evaluate ASD awareness among paediatricians and primary healthcare professionals in Singapore and to identify gaps in knowledge that could impede early diagnosis. **Method** An online survey was conducted via Google Forms, comprising questions on demographics, perception and knowledge of ASD. **Results** Of 181 healthcare professionals, 89% worked with preschool children regularly. Only 43.7% felt confident in identifying signs of ASD and 8.3% correctly identified all four early warning signs of ASD. Although 97.2% felt it was necessary to refer children with suspected ASD to specialists, 31.5% still believed in a “watch and wait” approach. **Conclusion** There is a lack of awareness of ASD among healthcare professionals in Singapore, emphasising the need for bridging knowledge gaps in ASD.

Keywords: autism, knowledge, survey, healthcare professional

INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental disorder manifesting in early childhood that is associated with qualitative impairments in social communication and social interaction, together with restricted or repetitive interests and behaviours (1). ASD is reported across all racial and socioeconomic groups, affects 1 in 100 people in the UK (2) and 1 in 59 children in the USA (3), and is the leading cause of disease burden in children aged between 0 and 14 years in Singapore (4).

Early identification of ASD is of paramount importance as it allows for timely referrals to specialists and access to early intervention (5). Intensive and early behavioural and educational interventions have been shown to have lasting long-term effects on the outcomes in children with ASD (6,7). Internationally, the American Academy of Paediatrics (AAP) and National Institute for Health and Care Excellence (NICE) UK have guidelines in place for early identification and management of ASD in primary care (8, 9). The AAP advocates for targeted ASD screening for all children at 18 and 24 months of age. Similar guidelines were also produced in Malaysia and Singapore (10-12).

Parents of children with ASD might notice symptoms between the ages of 15 and 19 months and raise concerns to their general practitioners (GPs) or paediatricians (13, 14). Similarly, early warning signs of ASD, such as delayed pointing and poor response to name, can be reliably picked up during well baby checks by primary healthcare nurses (15). The age at which ASD can be reliably diagnosed is determined to be as early as 24 months (16). However, a population-based study done in the USA showed that the median age of diagnosis was 5.7 years (17), revealing a wide gap between the time at which ASD can be detected and when ASD is actually diagnosed by clinicians. In Singapore, the mean age of diagnosis of ASD is approximately 3 years 10 months (18). Nevertheless, even earlier diagnosis can allow for earlier, and hence more effective intervention.

In Singapore, a study done in 2002 showed that many GPs lacked adequate knowledge about childhood developmental disorders, and further training was recommended (19). Since then, there have not been any

studies done in Singapore to assess the knowledge and awareness of ASD among healthcare professionals, and to see if things have improved. This study has clinical implications to improve education related to ASD across key healthcare disciplines in Singapore, particularly for healthcare professionals regularly seeing young children in the primary healthcare sector. Providing accurate information about ASD to families and caregivers of children with ASD can have a great impact on the overall prognosis of these children.

Therefore, the primary aim of this study was to evaluate the knowledge and awareness of ASD among paediatricians and other healthcare professionals in Singapore, and to identify gaps in knowledge that could hinder early diagnosis and intervention for ASD.

METHODS

The study involved healthcare professionals in Singapore and was conducted between December 2019 and January 2020. The KK Women's and Children's Hospital (KKH) Department of Child Development (DCD) is a specialised developmental clinic for preschool children in a tertiary paediatric hospital and is the larger of two national child development units in the country. Per year, the department sees approximately 4000 new preschool-age referrals, has more than 10,000 follow up visits, and diagnoses approximately 500 new cases of ASD. Most of the referrals to KKH DCD come from primary healthcare professionals.

Participants were recruited via email containing a link for an online Google Forms questionnaire. We set out to survey as many primary healthcare as well as paediatric doctors and nurses as these were the healthcare professionals that were most likely to do developmental screening and encounter children with signs of ASD. The email was sent to all paediatricians, paediatric subspecialists and paediatric nurses in KKH, as well as to all members of the College of Paediatrics and Child Health, Singapore. The email was also sent to the College of Family Physicians, Singapore in order to recruit GPs and primary healthcare nurses. The study was exempted from ethics approval as the survey was fully anonymised and no patient data were accessed.

The questionnaire comprised five sections. The first section obtained information about the general demographics and clinical profile of the respondents. To ensure privacy, personal identifiers were not collected. For respondents who did not see any children in their clinical practice, the survey ended for them after the first section.

The second section asked about the usual clinical practice of the healthcare professionals with regard to conducting developmental screening for their paediatric patients.

The third section asked about the respondents' previous experiences with people with ASD. In this section, we included the use of a Likert scale for the respondents to rate themselves on their perceived knowledge of ASD, confidence in identifying ASD signs in patients, as well as confidence in communicating a diagnosis of ASD to parents of their patients.

The fourth section was a survey on the respondents' perceptions regarding various views as well as alternative therapies for ASD. The final section of the questionnaire was a knowledge quiz comprising 11 questions. Each question carried 1 point and the pass mark was taken to be 50%, or 6 points. The answers for the quiz were provided in a separate link at the end of the questionnaire for educational purposes.

Data were analysed using SPSS Statistics 21. Continuous data were analysed between groups using the unpaired t-test, and categorical data were analysed using chi-squared or Fisher's exact tests. Healthcare professionals were divided into five groups: Paediatricians, paediatric trainees, GPs, nurses, and others (doctors from other specialties and allied health professionals).

RESULTS

A total of 195 healthcare professionals completed the questionnaire. Of these, 14 did not see any children under the age of six years in their clinical practice and hence terminated the questionnaire after the first section. Of the 181 healthcare professionals included in data analysis (Table 1), 89% saw preschool children regularly and only 27.1% had undergone previous training on ASD. 135 (74.6%) indicated that they conducted developmental assessments, yet 92 (68.1%) of the 135 had not been trained on ASD. Healthcare professionals who had been trained on ASD expressed higher mean (+/- SD) Likert scores for confidence in identifying (3.71 +/- 0.61 versus 2.94 +/- 1.03, $p < 0.001$) and communicating with parents (3.63 +/- 0.78 versus 2.70 +/- 1.11, $p < 0.001$) about ASD compared to those without training. Although 97.2% felt it is necessary to refer children with suspected ASD to specialists, only 49.7% would refer immediately, with 31.5% still practising a “watch and wait” approach.

Table 1. Demographics and Clinical Profile of Survey Respondents (N=181)

Variables	n (%)
Profession	
Paediatrician	50 (27.6)
Paediatric trainee	12 (6.6)
General practitioner	35 (19.3)
Nurse	65 (35.9)
Others (surgeon, non-paediatric trainee, psychiatrist, dermatologist, psychologist, speech therapist, educational therapist, exercise physiologist)	19 (10.5)
Duration of practice	
<5 years	22 (12.2)
5-15 years	72 (39.8)
>15 years	87 (48.1)
Type of institution	
Public hospital	127 (70.2)
Polyclinic	11 (6.1)
Private hospital	4 (2.2)
Private clinic	39 (21.5)
Number of children <6 years seen per month	
<10	20 (11.0)
10-50	64 (35.4)
>50	97 (53.6)
Developmental screening conducted	
No	46 (25.4)
Yes, sometimes	74 (40.9)
Yes, always	61 (33.7)
Number of children with suspected ASD seen per month	
0	43 (23.8)
1-5	117 (64.6)
>5	21 (11.6)
Confidence in identifying ASD signs in patients	
1 (not confident at all)	16 (8.8)
2	25 (13.8)
3 (neutral)	61 (33.7)
4	74 (40.9)
5 (very confident)	5 (2.8)
Confidence in communicating with parents about suspected ASD in their child	
1 (not confident at all)	26 (14.4)
2	30 (16.6)
3 (neutral)	59 (32.6)
4	59 (32.6)
5 (very confident)	7 (3.9)
How soon a child with suspected ASD is referred to a specialist	
The first time symptoms are noticed	90 (49.7)
I refer them only if the parents request for a referral	34 (18.8)
After watching and waiting for a few months	57 (31.5)

Table 2 shows the responses of the healthcare professionals on their views and perception of people with ASD. Out of the 181 survey respondents, majority (94%) had previously interacted with people with ASD. 25% of the respondents considered ASD to be a mental disorder and 17% had the perception that most children with ASD would eventually outgrow it by adulthood.

Table 2. Survey Respondents' Interaction With and Perception of People with ASD (N=181)

Variables	n (%)
Any previous interaction with people with ASD	
Yes	170 (93.9)
No	11 (6.1)
Perception of ASD	
1. ASD is a mental disorder	
Yes	45 (24.9)
No	136 (75.1)
2. Diagnosing a child with ASD will lead to discrimination against the child	
Yes	68 (37.6)
No	113 (62.4)
3. Most children with ASD will eventually outgrow it	
Yes	31 (17.1)
No	150 (82.9)
4. It is necessary to refer patients with suspected ASD to specialists	
Yes	176 (97.2)
No	5 (2.8)
5. All children with ASD prefer to play alone	
Yes	50 (27.6)
No	131 (72.4)
6. Which of the following alternative therapies help to improve ASD? Tick all that apply	
Meditation / mindfulness	67 (37.0)
Gluten-free casein-free diet / other special diets	24 (13.3)
Traditional Chinese medicine / acupuncture	4 (2.2)
Animal therapy	99 (54.7)
Music therapy	125 (69.1)
None of the above	41 (22.7)

Perceptions of the role of alternative therapies in helping to improve ASD were divided (Table 3). 140 (77.3%) respondents felt that alternative therapies helped to improve ASD while 41 respondents did not think so. There was a statistically significant difference between professional groups, with 59/65 (90.8%) of nurses, compared to 26/35 (74.3%) of GPs and 32/50 (64%) of paediatricians believing in the role of alternative therapies (Fisher's exact $p=0.007$). There was no significant difference in opinions on alternative therapies by duration of practice, ASD training, or knowledge rating.

Table 3. Survey Respondents' Opinions on the role of Alternative Therapies on ASD based on Professional Groups (N=181)

	Paediatrician	Paediatric Trainee	General Practitioner	Nurse	Others	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Alternative therapies help to improve ASD						
Yes	32 (64)	8 (66.7)	26 (74.3)	59 (90.8)	15 (78.9)	140 (77.3)
No	18 (36)	4 (33.3)	9 (25.7)	6 (9.2)	4 (21.1)	41 (22.7)
Meditation/Mindfulness help to improve ASD						
Yes	4 (12.5)	3 (37.5)	14 (53.8)	38 (64.4)	8 (53.3)	67 (47.9)
No	28 (87.5)	5 (62.5)	12 (46.2)	21 (35.6)	7 (46.7)	74 (52.1)
Animal Therapy helps to improve ASD						
Yes	25 (78.1)	7 (87.5)	22 (84.6)	33 (55.9)	23 (80.0)	99 (70.7)
No	7 (21.9)	1 (12.5)	4 (15.4)	26 (44.1)	3 (20.0)	41 (29.3)

Table 4. Survey Respondents' Knowledge about ASD (N=181)
Correct answers to the quiz are in bold italics

Variables	n (%)
Previous training (workshops, conferences, etc) in ASD	
Yes	49 (27.1)
No	132 (72.9)
Self-rated knowledge on ASD	
1 (not knowledgeable at all)	14 (7.7)
2	36 (19.9)
3 (neutral)	84 (46.4)
4	44 (24.3)
5 (very knowledgeable)	3 (1.7)
Score on Knowledge Quiz	
3-5	30 (17)
6-8	123 (68)
9-11	28 (15)
Knowledge Quiz ¹	
What is the estimated prevalence of ASD in Singapore?	
1 in 50	28 (15.5)
1 in 150	60 (33.1)
1 in 500	46 (25.4)
1 in 1000	47 (26.0)
Autism is more often diagnosed in boys than girls	
True	162 (89.5)
False	19 (10.5)
Which of the following are early warning signs of ASD? Tick all that apply	
No response to name	104 (57.5)
No words at 12 months	59 (32.6)
No pointing at 18 months	97 (53.6)
Poor eye contact	173 (95.6)
No spontaneous sharing	94 (51.9)
Number of survey respondents who selected correct 4 answers	15 (8.3)
Which of the following is not in the DSM-5 diagnostic criteria for ASD?	
Deficits in communication and social interaction	11 (6.1)
Cognitive Delay	108 (59.7)
Stereotyped or repetitive movements	21 (11.6)
Restricted interests	41 (22.7)
Emotional deprivation results in ASD	
True	40 (22.1)
False	141 (77.9)
The MMR vaccine results in ASD	
True	4 (2.2)
False	177 (97.8)
M-CHAT is an ASD screening tool	
True	162 (89.5)
False	19 (10.5)
Families with one child with ASD are at 10-20 times increased risk of having a second child with ASD	
True	124 (68.5)
False	57 (31.5)
Epilepsy is a common comorbidity of ASD	
True	58 (32)
False	123 (68)
Which of the following syndromes is most commonly associated with ASD?	
Down Syndrome	45 (24.9)
Fragile X Syndrome	77 (42.5)

Angelman Syndrome	31 (17.1)
Prader-Willi Syndrome	28 (15.5)
Early intervention is key for improvement in ASD	
True	181 (100)
False	0 (0)

Among the 140 who indicated belief in some forms of alternative therapies, there was no significant difference in opinions on special diets, Traditional Chinese Medication (TCM)/acupuncture, or music therapy. However, there was a statistically significant difference on the role of meditation/mindfulness by professional groups, with 38/59 (64.4%) of nurses and 14/26 (53.8%) of GPs believing in meditation/mindfulness while only 4/32 (12.5%) of paediatricians did (Fisher's exact $p < 0.001$). There was also a statistically significant difference in the role of animal therapy by professional groups, with 33/59 (55.9%) of nurses, compared to 22/26 (84.6%) of GPs and 25/32 (78.1%) of paediatricians believing in the role of animal therapy (Fisher's exact $p = 0.030$).

Table IV shows the respondents' perceived knowledge about ASD and the results of the knowledge quiz. Although 26% of respondents reported that their self-perceived knowledge about ASD was 4 to 5 points on the Likert scale, none of the survey respondents achieved the maximum score of 11 for the knowledge quiz. The quiz scores ranged from 3 to 10 points, with majority (68%) scoring between 6 to 8 points and 30 (17%) respondents failing the quiz. The mean (+/- SD) quiz score for healthcare professionals who had undergone previous training on ASD was significantly higher than those who had not been trained (8.10 +/- 1.87 versus 6.92 +/- 1.71, $p < 0.001$), but duration of practice (ie. years of clinical experience) made no difference.

Among the different professional groups, the mean (+/- SD) quiz score was not statistically significantly different between paediatricians and paediatric trainees but was significantly lower for GPs compared to paediatricians (7.00 +/- 1.35 versus 8.52 +/- 1.78, $p < 0.001$), nurses compared to paediatricians (6.05 +/- 1.39 versus 8.52 +/- 1.78, $p < 0.001$), and nurses compared to GPs (6.05 +/- 1.39 versus 7.00 +/- 1.35, $p = 0.001$).

Only 8.3% of respondents correctly identified all four early warning signs of ASD. 40.9% got 2 or 3 out of the 4 signs correct while 50.8% managed to identify only one or none at all. Again, healthcare professionals who had undergone ASD training were more likely to get most of the early warning signs correct compared to those with no training (32/49, 65.3% versus 57/132, 43.2%, Fisher's exact $p = 0.023$). Paediatricians (31/50, 62%) and paediatric trainees (8/12, 66.7%) were more likely to get the question correct or partly correct, whereas GPs (17/35, 48.6%) and nurses (22/65, 33.8%) were not (Fisher's exact $p = 0.015$).

Having been trained in ASD did not make statistically significant differences to the percentage of healthcare professionals getting the other knowledge quiz questions correct except for questions 4 (DSM-5 criteria: 38/49, 77.6% versus 70/132, 53.0%, Fisher's exact $p = 0.012$) and 5 (emotional deprivation: 44/49, 89.8% versus 97/132, 73.5%, Fisher's exact $p = 0.025$). While most (89.5%) respondents correctly recognised that the M-CHAT is an ASD screening tool, fewer GPs (28/35, 80%) and nurses (55/65, 84.6%) knew about the M-CHAT than paediatricians (49/50, 98%) (Fisher's exact $p = 0.016$). More paediatricians (39/50, 78%) and GPs 28/35, 80%) knew about the increased risk of ASD in a second child compared to nurses (37/65, 56.9%) (Fisher's exact $p = 0.011$).

123 (68%) respondents did not know that epilepsy is a common co-morbidity of ASD, and 104 (57.5%) respondents were unaware that Fragile X is the most common genetic syndrome associated with ASD. Despite the lack of knowledge in these areas, all of the respondents were aware that early intervention is key.

DISCUSSION

The prevalence of ASD has been on the rise globally. ASD is diagnosed clinically based on a patient's presentation, without the help of any biomarkers or laboratory tests, hence it is important for healthcare professionals to be familiar with the diagnostic criteria of ASD to ensure timely intervention for the patients. Providing accurate information about ASD to families and caregivers of children with ASD can also greatly impact the overall prognosis of these children (20).

Children with ASD typically encounter multiple healthcare professionals before they are diagnosed (21). Changing any negative and erroneous views of primary healthcare professionals about ASD should in turn encourage appropriate help-seeking among parents who might notice symptoms in their children as early as 15 to 18 months of age (13, 14). Barriers that contribute to the delayed diagnosis of ASD include inadequate knowledge and inaccurate beliefs about ASD among healthcare professionals (22, 23). Parents with early concerns about ASD are sometimes falsely reassured by healthcare professionals, leading to a delay in the diagnosis of ASD (24). The knowledge that healthcare professionals possess to identify and diagnose ASD has a significant impact on the subsequent treatment and overall prognosis of children with ASD (25). Primary healthcare providers act as a gateway to specialist services (26) and trained nursing staff can accurately identify children with ASD from as young as 12 months old (15). It is hence imperative to bridge gaps to enable healthcare professionals to make earlier diagnoses.

Surveys on ASD awareness among medical professionals date back to the 1980s (27) and have shown that ASD is an often-misunderstood condition with misperceptions about clinical features (28) prognosis, and management (29), even within the past decade (30-32).

In Singapore, Lian et al previously surveyed 48 GPs in 2002 to understand their knowledge of childhood behavioural and developmental disorders (19). Survey results revealed significant gaps in knowledge of the causes of ASD and awareness of the support services available for affected patients. While that survey comprised more general developmental questions and the two surveys are therefore not directly comparable, our current study continues to show knowledge and educational deficits in developmental paediatrics as concluded by the previous study. The current study also expands on the previous one by including data from other essential professional groups most likely to encounter young children first-line regularly, i.e., nurses and paediatricians/paediatric trainees.

Rahbar et al also found that GPs who were in service for more than 30 years had limited knowledge of ASD compared to those who were recently medically qualified (32). Similarly, our survey found that it was training in ASD which improved knowledge scores, rather than duration of practice. More senior GPs and paediatricians would therefore likely benefit from specific training in ASD as much as younger trainees do, to enable more timely recognition and referral of very young children with ASD to appropriate diagnostic and early intervention services. Varying levels of knowledge on ASD were also seen in the population we surveyed, with paediatricians and paediatric trainees having higher scores than GPs or nurses. This can be attributed to the general nursing curriculum being less likely to focus on conditions such as ASD when compared to specific paediatric training for doctors. Nevertheless, this highlights a potential training gap for nurses, particularly those working in primary healthcare and seeing young children frequently. Primary healthcare nurses may be an underutilised resource for ASD screening in that, as shown by Barbaro et al, trained nursing staff can accurately identify child with ASD.

In order to improve neurodevelopmental screening and support in Singapore, all primary healthcare professionals, including nurses, have a pivotal role to play in identifying early warning signs of ASD and referring these children for early and appropriate intervention. There is a need for a high level of knowledge and awareness of ASD as primary healthcare professionals are often the first point of contact. However, results from this study showed that although 89% of the respondents worked with preschool children regularly, only 43.7% felt confident in identifying signs of ASD, and only 27.1% had undergone previous training on ASD. Looking at the individual professional groups, only 10.8% of nurses and 17.1% of GPs had received any formal training on ASD, and even amongst paediatricians, only 33.3% of trainees and 48% of specialist-accredited paediatricians had been trained. These results clearly show that there are gaps in our current training programmes for all these professional groups, and there needs to be active implementation of compulsory training in ASD and child development issues put in place urgently. Furthermore, although 97.2% felt it is necessary to refer children with suspected ASD to specialists, only 49.7% would refer immediately, with 31.5% still practising a 'watch and wait' approach. This is despite various national and international guidelines strongly advising for immediate and early referrals.

The extent of knowledge can also vary among medical professionals and correlates directly with their training in ASD and their experience working with those affected (31, 33). This gap in knowledge was also found in our study where only 15 (8.3%) of survey respondents got the question on early warning signs entirely correct, i.e. identifying all 4 correct options. This is despite the fact that 26% of respondents reported that their self-perceived knowledge of ASD was 4 to 5 points on the Likert scale, indicating that they were confident to very confident in identifying ASD symptoms. Approximately half of the respondents got the question wrong by selecting only 1 sign correctly or not selecting any correct options at all. In addition, only 108 (59.7%) of the survey respondents were familiar with the DSM-5 criteria for ASD and therefore correctly identified that cognitive delay was not part of the diagnostic criteria, meaning that the other 40% were under the impression that cognitive delay was part of the disorder. Again, this would be important to highlight in training sessions on ASD, as over half of children with ASD do not have intellectual disability (3) and may be supported in mainstream environments provided adequate support is available.

Not all survey respondents were aware of the increased risk for ASD in siblings of children with ASD. Published studies have shown that the rate for siblings being affected if a family has a child with ASD is 5-20%, and rises to 35% in families with two or more affected children (34). Hence, if one child in the family is diagnosed to have ASD, the relative risk for a sibling to also have ASD is estimated to be approximately 20 times higher than the background population (i.e., a 'high-risk sibling') (35). During regular developmental surveillance, it is therefore important to obtain a detailed family history for a primary healthcare professional to know if a child needs additional ASD-specific screening. Other associated risk factors for ASD include preterm birth, low birth weight, advanced parental ages, maternal depression/diabetes/immune disorders, and maternal anticonvulsant or psychotropic drug use (36).

Although the main evidence-based therapies for ASD continue to be behavioural, educational, and communication-based therapies, various alternative therapies continue to exist despite a lack of clear evidence for efficacy (37). In our study, a startlingly high 77.3% of our survey respondents believed in the role some alternative therapies in the treatment of ASD. 13% of them had the view that a gluten-free and casein-free (GFCF) diet had an impact in improving the prognosis of a child with ASD, however current literature has not shown strong evidence on the impact of a GFCF diet on the prognosis of ASD(38). In addition, a relatively high number of paediatricians (78.1%) believed in the role of animal therapy. This might reflect the fact that there is some evidence supporting animal therapy, although the studies have been criticised for methodological flaws (39, 40).

LIMITATIONS

There are several limitations to our study. Although the survey was sent out to capture as many responses from paediatricians, GPs and nurses as possible, there is a likelihood of selection bias in who responded to the survey. Also, we do not know how representative of their professional groups the respondents are. The questionnaire developed for this study was based on several examples from other surveys on ASD and their findings, but the survey itself was not validated. There is the possibility that some of the questions in our questionnaire were unclear. For example, the question on alternative therapies asked about the professional's perspectives on the therapies but did not ask if the professional would recommend these therapies to their patients. Similarly, describing ASD as a mental disorder might be construed by some as correct as it is listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM) after all.

Future Research Directions

This survey could be repeated following modifications to the medical and nursing curriculum as suggested. Additionally, evaluating knowledge of health professionals immediately pre- and post-ASD teaching sessions would be useful, but this should also include longer-term evaluation 6-12 months post-teaching to assess for retention of knowledge.

CONCLUSION

This study has important clinical implications and calls for more education on ASD across key healthcare disciplines in Singapore, particularly for healthcare professionals regularly seeing young children in the primary healthcare sector. It has been 18 years since the previous published survey on GP's knowledge of developmental disorders (19), and there is still room for improvement in awareness, training, and confidence in managing ASD amongst healthcare professionals caring for young children here. Crucially, many still lack the ability to correctly identify early warning signs of ASD. Furthermore, misconceptions about 'outgrowing ASD' along with the misunderstandings on the communicative and cognitive abilities of children with ASD seem little different from earlier surveys dating back to the 1980s.

In addition, more than half (73%) of our survey respondents had not received prior training on ASD, which could explain the gap in knowledge of ASD. In order to bridge the gap in knowledge and to raise awareness of ASD among healthcare professionals, more clinical forums and workshops should be held. Keeping abreast with child development and common neurodevelopmental disorders should be an important part of our Continued Medical Education (CME) efforts as members of the healthcare community here in Singapore. Available resources and education should start early in medical and nursing schools and should continue during specialist training. Modifications to residency and nursing training programmes to include mandatory modules on ASD could facilitate more accurate diagnosis and timely referrals to specialists for intervention and treatment.

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