

parental spoiling.^[4] Another two studies in Thailand and South Texas revealed similar findings showing lack of knowledge among school teachers about ADHD.^[5,7,8] The female teachers from schools of Makkah also reported insufficient information regarding ADHD.^[1] Two studies from Saudi Arabia have reported the 11.6% and 16.3% prevalence of ADHD among primary school students.^[2,9] However, a study done at primary schools in Dammam reported a higher prevalence of the inattention group as compared to hyperactivity among male students.^[10]

Primary school teachers have a major role in helping children with ADHD, as they can be the first ones to identify the disorder. Thus, lack of knowledge among primary school teachers can result in late intervention. This study aimed to assess the level and source of knowledge and attitude of primary school teachers about ADHD in the capital city of Saudi Arabia.

METHODS

Study design and settings

A cross-sectional study was conducted between January and November 2016 in 17 Governmental primary schools at Khashm-Alaan, Riyadh, Saudi Arabia. There are almost 350 teachers and 7500 students enrolled in these schools. Ethical approval was granted by the Ethical Review Board of King Abdullah International Medical Research Center, Riyadh, Saudi Arabia. The study was approved on September 26, 2016 with IRB E-CTS Ref. No (RYD-16-419812-146224).

Study participants and sampling technique

All Saudi male teachers currently working in primary male schools of study area were included. Any staff working on administrative positions; who were not directly involved in teaching the students were excluded. For sample size, the knowledge of teachers about ADHD was considered 42.6% based on a previous study done in Makkah.^[1] With 95% confidence interval and 5% margin of error, the optimal sample size calculated was 182 teachers for this study.^[11] Convenience sampling technique was used for enrollment of participants because information about the currently working teachers could not be assessed.

Study questionnaire and data collection process

A self-administered structured questionnaire from two separate published studies was adapted for data collection.^[1,12] The Knowledge of Attention Deficit Disorder Scale (KADD) was used for assessing teachers' knowledge which was already available in Arabic language. While the attitude questions were in English and later translated to Arabic for this study. Then, as the third step, backward translation was done to check for the validity of the content of the translated questions. All steps for translation process were followed carefully and for measuring the reliability of the final questionnaire in Arabic and Cronbach's alpha was calculated as 0.84. Knowledge and

attitude were assessed using 5-point Likert Scale with 1 as strongly disagree and 5 as strongly agree.

The coinvestigators visited all 17 primary male schools. The questionnaires were provided to the respective principal of each school for distribution to teachers and collected back on the same day. The participation in the study was voluntary, and all participants were given informed consent form along with the questionnaire. Anonymity and confidentiality were always maintained throughout the study.

Statistical analysis

Data were first entered in Microsoft Excel sheet then transferred to Statistical Package for the Social Sciences (SPSS, version 22; IBM CORP., ARMONK, NY, USA) file for analysis. Finally, data were analyzed and new variables were computed based on total scores. Teacher's knowledge was categorized according to the total knowledge score into four categories; insufficient (mean score $\leq 60\%$), good (mean score 61%–75%), very good (mean score 76%–85%), and excellent (mean score $>85\%$). In this study, the excellent and very good were later grouped together for the purpose of inferential statistics as only one participant had excellent knowledge score. The maximum score was 85 which showed excellent knowledge about ADHD and the minimum was 17 suggesting no knowledge about ADHD based on KADD scoring. The teacher's attitude was categorized as agree, neutral, and disagree; 5 and 4 on the Likert Scale were considered as agree, 2 and 1 as disagree, and 3 as neutral. Spearman correlation was used to assess the relationship between knowledge and attitude mean scores. Chi-square test and analysis of variance were also used for measuring association between variables. $P < 0.05$ was considered to show a statistically significant association for all applied statistical tests.

RESULTS

The questionnaire was distributed to 182 participants; only 141 questionnaires were completed and returned by the principal of primary schools. Mean age of the teachers was 36.16 ± 6.5 years with minimum teaching experience of 3 years, while the maximum was 32 years. Most of them had a bachelor's degree as their highest achieved qualification (86% [123]) [Table 1].

Assessment of knowledge about attention-deficit and hyperactivity disorder

Teacher knowledge was assessed by asking questions related to common behavioral and psychomotor agitation signs exhibited by these children in school. Mean knowledge score was 3.8 ± 0.5 and cutoff level for total knowledge score was 60 and below for labeling as having insufficient knowledge. Out of 141 teachers, 83 (59%) had good knowledge about ADHD and only 40 (28%) had insufficient knowledge. The main source of information about ADHD was internet 64 (49%), followed by social media 45 (34%). Mass media, i.e., television and books were also used as information sources [Table 2].

Table 1: Demographic characteristics of study participants (n=141)

Variables	n (%)
Age (years)	
Mean±SD	36±6
Median	35
Range	26-55
Teaching experience (mean±SD)	12±6
Education level	
Masters and above	19 (14)
Bachelor and diploma	123 (86)
Teaching grade	
1 st grade	18 (13)
2 nd grade	10 (7)
3 rd grade	4 (3)
4 th grade	7 (5)
5 th grade	7 (5)
>1 grade	95 (67)
Teaching specialty	
Islamic	34 (24)
History	4 (3)
Math	17 (12)
Arabic	33 (23)
English	4 (3)
Science	11 (8)
Multiple subjects	15 (11)
Others	23 (16)

SD: Standard deviation

Assessment of attitude toward attention-deficit and hyperactivity disorder

Attitude toward ADHD was assessed by asking 12 questions based on a Likert Scale. The mean attitude score was 3.9 ± 0.40 . All the scores were added, and the percentage of agree, neutral, and disagree score was determined for each item. To measure agreed items, a score of 5 and 4 was added, while 2 and 1 were added up to calculate disagreed items. The 3 on Likert Scale was kept, as it is, i.e., neutral. The highest percentage of agreement was reported by teachers 129 (92%), who participated in teacher's training in behavioral management. Furthermore, 122 (87%) teachers agreed that treatment should be done if recommended by doctors. Items related to causality of ADHD were more marked as neutral by the teachers, i.e., parents being inconsistent with rules and regulation, and family problems may contribute to ADHD, were reported as neutral by 52 (37%) and 46 (33%) of the teachers, respectively [Table 3].

Association of demographic characteristics and knowledge scores

The demographic variables including age, working experience, and educational level showed no significant relationship with overall knowledge and attitudes toward ADHD. However, those who either attended courses on ADHD or taught a child with ADHD had more knowledge about the disorder

Table 2: Information sources and knowledge about attention-deficit and hyperactivity disorder (n=141)

Variables/items	n (%)
Do you have enough information about ADHD	
Yes	32 (23)
No	50 (36)
Not sure	59 (42)
Heard about ADHD	
Yes	131 (93)
No	10 (7)
Read about ADHD	
Yes	94 (67)
No	47 (33)
Main source of information about ADHD (n=132)	
Internet	64 (49)
Social media	45 (34)
TV/media	36 (27)
Books	31 (23)
Magazine	9 (7)
Attended courses on ADHD	
Yes	26 (18)
No	115 (82)
Taught a child with ADHD	
Yes	80 (57)
No	61 (43)
Knowledge score	
Insufficient	40 (28)
Good	83 (59)
Very good	18 (13)

ADHD: Attention-deficit and hyperactivity disorder

than others (Chi-square value $\chi^2 = 10.39$ [$P < 0.01$] and $\chi^2 = 13.36$ [$P < 0.01$], respectively) [Table 4].

Correlation between knowledge and attitude mean scores

The knowledge and attitude scores were significantly ($P < 0.03$) related to educational level of the teachers. Those who attended courses on ADHD also showed better knowledge ($P < 0.01$). The inferential statistics also revealed that there was significant ($r = 0.33$ and $P < 0.00$) positive Spearman's correlation between knowledge and attitude [Table 5].

DISCUSSION

Primary school teachers play a major role in early identification of students with ADHD, as most of their symptoms become apparent in early school days. Hence, basic knowledge is crucial for primary school teachers to facilitate early recognition and intervention for students with ADHD. Our survey found that majority of primary school teachers had knowledge about ADHD. Unfortunately, the teacher's knowledge was only reported to be good according to KADDS score, which reflects knowledge gap on the expected teacher perception of ADHD. This gap was observed despite more than half of the participants having taught students with ADHD. Similar findings were reported from international and national studies using the same survey tool where teachers demonstrated a fair

Table 3: Attitude toward attention-deficit and hyperactivity disorder

Variables/items (n=141)	Agree, n (%)	Neutral, n (%)	Disagree, n (%)
Training teachers in behavioral management is important	129 (92)	9 (6)	3 (2)
Improving the parents' skill would benefit their children	122 (87)	16 (11)	3 (2)
ADHD child should be treated if recommended by a doctor	122 (87)	17 (12)	2 (1)
Social skill training can be helpful for a child with ADHD	121 (86)	18 (13)	2 (1)
Behavioral management is an effective treatment	118 (84)	20 (14)	3 (2)
Clear consistent rules and consequences are helpful in treating ADHD	118 (84)	21 (15)	2 (1)
Teaching techniques are helpful in managing ADHD	113 (80)	23 (16)	5 (4)
ADHD can be the result of the child not trying to control his/her behavior	97 (69)	39 (28)	5 (4)
ADHD results from parents being inconsistent with rules and consequences	81 (58)	52 (37)	8 (6)
Family problems may contribute to a child's ADHD	67 (48)	46 (33)	28 (20)
I want to learn specialized teaching techniques to treat an ADHD child	68 (48)	27 (19)	46 (33)
Children develop ADHD as they need attention	63 (45)	52 (37)	26 (18)

ADHD: Attention deficit and hyperactivity disorder

Table 4: Association of knowledge scores

Variables items	Knowledge			P*
	Insufficient (%)	Good (%)	Very good (%)	
Courses attended on ADHD				
Yes	1 (4)	22 (85)	3 (11)	0.006
No	39 (34)	61 (53)	15 (13)	
Ever taught child with ADHD				
Yes	13 (16)	55 (69)	12 (15)	0.001
No	27 (44)	28 (46)	6 (10)	

*For categorical variables, the Chi-square test or Fisher's exact test was used. ADHD: Attention-deficit and hyperactivity disorder

Table 5: Association of knowledge and attitude scores with demographic variables

Variable	Frequency N=141	Mean ± SD	
		Knowledge score	Attitude scores
Age (years)			
26-35	71	65.2±8.1	47.1±4.8
36-45	56	65.2±9.1	46.7±4.6
46-55	14	67.0±6.8	46.6±6.1
P*		0.76	0.86
Working experience (years)			
1-10	69	65.2±7.9	47.3±5
11-20	60	65.6±9.5	46.4±4.9
>20	12	65.6±5.8	47.1±4.1
P*		0.96	0.61
Education			
Doctoral	1	44	40
Masters	18	64.7±6.7	47±3.3
Bachelor and diploma	122	65.6±8.4	46.9±5
P*		0.03**	0.18
Attended courses			
Yes	26	69.6±6.3	47.6±4.9
No	115	64.5±8.6	46.6±4.8
P*		0.001**	0.44

*ANOVA test applied, **Test significant at P<0.05. SD: Standard deviation, ANOVA: Analysis of variance

amount of knowledge on ADHD manifestation. However, a deficiency on knowledge was frequently reported on the aspects of diagnosis and treatment.^[4,8,9]

The current study showed that 30% of primary school teachers had significant ADHD knowledge insufficiency. This finding is consistent with previous published reports where most elementary school teachers expressed deficiency in information related to ADHD.^[4,8,13,14] The knowledge insufficiency could be related to the source used to obtain the information, i.e., social media and internet. Only 18% of the participants indicated that knowledge was obtained through structured training programs or courses. The fact that this is the era of networking and everything is available on internet; however, depending on Internet as a source of information is not appropriate, as not all the information available online is from authentic sources and when it comes to information about a disease, one must be cautious. This is probably the reason why the results showed that teachers' perception about having enough information about the causality of the disease was reported as not sure by 42% of participants. Information through internet and social media was reported to be the major source in other studies as well that examined the teacher's knowledge for ADHD.^[4,8,9]

Our study reported a significant association between teacher's knowledge and attendance of structured training course. Attendance of structured training courses affected the knowledge but not the teacher's attitude toward students with ADHD. Sarraf *et al.*^[15] reported that there was no association in teachers' knowledge between those who did not or attended the courses. Structured training course was reported as one of the main sources of information about ADHD reported in a recent study from Saudi Arabia.^[16] Incidentally, years of experience and age had no significant contribution for better knowledge among surveyed teachers. Published reports had varied widely on promoting factors for better knowledge. For instance, Muanprasart *et al.*^[8] reported that younger teachers had better ADHD knowledge. Furthermore, Youssef *et al.*^[17] reported that teacher with postgraduate degree and who received training for ADHD scored higher, similar to that observed in our study. Many other factors such as teacher self-efficacy,

training in psychology, teaching student with ADHD, and years of experience are also reported in literature to promote ADHD knowledge. However, an actual relationship between variety of factors and level of knowledge of ADHD are never well established.^[4,9,14,18]

Most of the participants in our survey tend to have a positive attitude toward ADHD. Student's referral for medical care and enrollment in specific classes was one of the most agreed on positive attitude.^[19] While Moldavsky *et al.*^[20] reported that teachers preferred to assess and manage the child's difficulties with the help of educational colleagues and they were careful about referring the child to health services. The positive teacher's attitude in our survey was observed to be weakly correlated with higher level of knowledge. Based on our review, we observed that primary school teachers who received structured courses have altogether better knowledge than other teachers.

Several limitations in this research might restrict the generalizability of the results at large, nonetheless being conducted in the capital city of Saudi Arabia study holds an importance from a local perspective. The self-reported nature of the study might have led to some exaggeration on the part of participants and maybe this is one of the reasons that our study reported the overall knowledge about ADHD to be good. The private schools were not included due to limited time and resources for inclusion of larger sample size. However, the KADDS survey tool used in the study is a validated tool used by many published studies and results can be considered reliable. Apart from having some limitation, the study holds importance in terms of highlighting the role of teachers and the identification of sources for teachers to acquire information about ADHD.

CONCLUSION

Two-third of the teachers had knowledge about ADHD in our study. Those who had either attended a course or taught a child with the ADHD had significantly more knowledge about the disorder. Most of the teachers learned about the disorder from multiple sources including structured courses, internet, and/or social media. A significant association was observed between knowledge and attitude scores of teachers. It is recommended that schools should invest in faculty development and arrange structured courses and workshops on children with ADHD and prepare the teachers to deal with special needs of children with ADHD. This study considered the situation in the governmental schools; future studies should be conducted to assess the situation in private schools as well.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Munshi AM. Knowledge of diagnosis and management of ADHD among female teachers in Saudi Arabia. *Med Sci Publ Health* 2014;3:434-5.
- Homidi M, Obaidat Y, Hamaidi D. Prevalence of attention deficit and hyperactivity disorder among primary school students in Jeddah city, KSA. *Life Sci J* 2013;3:10.
- Harpin VA. The effect of ADHD on the life of an individual, their family, and community from preschool to adult life. *Arch Dis Child* 2005;90 Suppl 1:i2-7.
- Khademi M, Rajezi-fahani S, Noorbakhsh S, Panaghi L, Davari-Ashtiani R, Razjouyan K, *et al.* Knowledge and attitude of primary school teachers in Tehran/Iran towards ADHD and SLD. *Global J Health Sci* 2016;8:141.
- Guerra FR Jr., Brown MS. Teacher knowledge of attention deficit hyperactivity disorder among middle school students in South Texas. *RMLE Online* 2012;36:1-7.
- Alqahtani MM. Attention-deficit hyperactive disorder in school-aged children in Saudi Arabia. *Eur J Pediatr* 2010;169:1113-7.
- Polanczyk G, de Lima MS, Horta BL, Biederman J, Rohde LA. The worldwide prevalence of ADHD: A systematic review and meta-regression analysis. *Am J Psychiatry* 2007;164:942-8.
- Muanprasart P, Traivaree C, Arunyanart W, Teeranate C. Knowledge of attention deficit hyperactivity disorder and its associated factors among teachers in 3 large primary schools in Phra Nakorn Sri Ayutthaya province, Thailand. *J Med Assoc Thai* 2014;97 Suppl 2:S107-14.
- Bella H. Attention deficit hyperactivity disorder (ADHD): Is it a health problem among male primary school children. *Bahrain Med Bull* 2008;30:67-71.
- Al Hamed JH, Taha AZ, Sabra AA, Bella H. Attention deficit hyperactivity disorder (ADHD) among male primary school children in Dammam, Saudi Arabia: Prevalence and associated factors. *J Egypt Public Health Assoc* 2008;83:165-82.
- Sample Size Calculator. Roasoft. Available from: <http://www.roasoft.com/samplesize.html>. [Last accessed on 2016 Dec 07].
- Gudmundsdottir BG. The psychometric properties of the ADHD Beliefs Scale-Revised. University of Rhode Island; 2014.
- González Tejera G, González M, Ramírez B, Rivera M. Attention deficit hyperactivity disorder in five schools of the San Juan metropolitan area: Assessment of teacher's knowledge. *Bol Asoc Med P R* 2009;101:31-5.
- Tyagi A, Jain RB, Sethi S. Knowledge of attention deficit hyperactivity disorder (ADHD) among primary school teachers of a rural block of Haryana. *Int J Basic Applied Med Sci* 2013;3:267-73.
- Sarraf N, Karahmadi M, Marasy MR, Azhar SM. A comparative study of the effectiveness of nonattendance and workshop education of primary school teachers on their knowledge, attitude and function towards ADHD students in Isfahan in 2010. *J Res Med Sci* 2011;16:1196-201.
- Abed M, Pearson S, Clarke P, Chambers M. Saudi Arabian teachers' knowledge and beliefs about ADHD. *J Int Assoc Spec Educ* 2014;15:67-74.
- Youssef MK, Hutchinson G, Youssef FF. Knowledge of and attitudes toward ADHD among teachers: Insights from a Caribbean Nation. *Sage Open* 2015;5:2158244014566761.
- Jarque Fernández S, Tárraga Mínguez R, Miranda Casas A. Teachers'

- knowledge, misconceptions, and lacks concerning attention deficit hyperactivity disorder. *Psicothema* 2007;19:585-90.
19. Rodrigo MD, Perera D, Eranga VP, Williams SS, Kurupparachchi KA. The knowledge and attitude of primary school teachers in Sri Lanka towards childhood attention deficit hyperactivity disorder. *Ceylon Med J* 2011;56:51-4.
 20. Moldavsky M, Pass S, Sayal K. Primary school teachers' attitudes about children with attention deficit/hyperactivity disorder and the role of pharmacological treatment. *Clin Child Psychol Psychiatry* 2014;19:202-16.