

Adult Attention Deficit Hyperactivity Disorder (ADHD) among residents of Saudi Arabia: a cross-sectional study

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Abstract. — **OBJECTIVE:** In this study, we aim to estimate the prevalence of adult ADHD among Saudi adults, determine its demographic correlates, the impact of the disorder on school/work, social life, and productivity, and describe its association with other psychiatric disorders such as depression and anxiety.

SUBJECTS AND METHODS: A cross-sectional study involving 993 adult participants was carried out utilizing a validated online questionnaire that was given to the Saudi population between January 2022 and March 2022. Socio-demographic information, the adult ADHD Self-Report Scale, the Sheehan Disability Scale (SDS), and the Hospital Anxiety and Depression Scale (HADS) are among the data gathered from the questionnaire.

RESULTS: Participants' median age group was 21-30 years (48.4%), with 77.8% being females. The prevalence of participants who were positive for ADHD symptoms was 46.6%. In univariate analysis, age group, marital status, depression, anxiety, Sheehan scale domains, day lost, and unproductive days were all significant risk factors for ADHD. In a multivariate regression analysis, anxiety, depression, symptoms that disrupted work/school work, family life/home responsibilities, and days unproductive remained statistically significant and determined as the significant independent predictors of positive ADHD.

CONCLUSIONS: Morbidity of adult ADHD symptoms appreciably existed among younger adults of Saudi Arabia, mostly students with no favorable genders. Adult ADHD symptoms were found to affect the quality of social life and work/schoolwork performance as they decreased the productivity rate and increased the absenteeism rate. Moreover, symptoms of depression and anxiety were in a profound correlation with Adult ADHD symptoms.

Key Words:

Adult, ADHD, Anxiety, Depression, Impairment, Saudi Arabia.

Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a severe neurodevelopmental condition characterized by impulsivity, excessive activity, and inattention¹. Until recently, ADHD has been regarded as a psychological condition that only occurs in children and has little to no long-term effects. Yet, a literature review² indicates that almost two-thirds of patients with clinical diagnoses of ADHD continue to exhibit chronic hyperactivity, poor attention, and aggressiveness throughout adulthood². Moreover, 2.5-5% of the overall population have had adult ADHD diagnoses³, and 17-22% of patients have the disorder while undergoing psychiatric outpatient treatment for conditions other than ADHD. These individuals with ADHD symptoms are frequently mistaken as having their underlying psychiatric disorders because of the close correlation between ADHD and other psychiatric disorders (such as severe depressive disorder, anxiety disorder, and alcohol dependence)⁴.

Despite the dearth of interest among researchers regarding adult ADHD, a few studies^{5,6} were conducted to bring the subject to the spotlight. According to the literature, only 20% of people with ADHD received a diagnosis or treatment⁵, and little is known about the implications of the disorder on individuals who do not receive treatment⁵. Another study⁶ indicated that less than 15% of adults who have been diagnosed with ADHD are receiving pharmacological treatment or another type of treatment, showing that adult ADHD is still mostly undiagnosed and untreated in most instances. A recent global systematic review⁶ acknowledged the scarcity of information

on adult ADHD prevalence in comparison to pediatric ADHD, and authors attributed it to the fact that adult ADHD is comparatively understudied in epidemiological studies, partly because there are no accepted, trustworthy, and confirmed diagnostic standards.

There are not many studies on adult ADHD in the Arab world to provide an accurate prevalence. Although adult ADHD is very widespread among the Arab community, barely 2 of the 22 countries in the region reported a countrywide incidence of adult ADHD, according to a more thorough assessment⁷ that solely examined the Arab region. ADHD is commonly associated with psychiatric disorders in the adult population, which makes it more difficult to recognize, diagnose, and treat. It has been suggested^{8,9} that up to 80% of adults with ADHD have at least one coexisting psychiatric condition. Adults with ADHD are most frequently diagnosed with Substance Use Disorders (SUDs), depression and anxiety, bipolar, and personality disorders⁴. In addition, persons with ADHD are more likely to seek treatment for their coexisting mental health issues at a psychiatric facility, and their ADHD symptoms are commonly mistaken for those of their coexisting disorders⁵.

The most prevalent comorbid conditions are anxiety and depressive disorder. Studies^{8,10,11} that examined the correlation between ADHD and depression found that 18-53% of individuals with ADHD experienced depressive symptoms, ranging from recurrent brief depression to totally depressed episodes. In contrast, incidences of coexisting ADHD in individuals who had depression ranged from 9-16%¹². According to other studies¹³, ADHD is linked to depression in the long run, with the risk of depression rising by an estimated 6.5 times within the first year after receiving an ADHD diagnosis. In addition, those with adult ADHD reported more frequent depression in early adulthood than those with only childhood ADHD (47.5% vs. 26.4%, respectively)¹⁴.

Regarding the co-occurrence between ADHD and anxiety, there is evidence¹⁵ that anxiety levels can rise in people with ADHD who also have comorbid anxiety disorders by up to 50%. Yet, anxiety has a considerable negative effect on the mental functioning of individuals with ADHD and their responsiveness to therapies^{16,17} because it lowers information filtering and impairs performance¹⁸. Further, many psychological and biological models have addressed the connection between ADHD and anxiety^{15,19}. The concept of

early assessment and management of these disorders while also evaluating ADHD has been recommended^{14,20} due to the significant overlapping between these comorbid disorders and ADHD. The idea that early and effective treatment of ADHD may be able to eventually avoid the development of psychiatric comorbidities in the future, notably for depression and anxiety, seems even more remarkable^{14,21}.

Due to the fact that most of the earlier local studies² on ADHD prevalence and effects on symptoms were undertaken in children while neglecting the likelihood that ADHD could persist\ occurs in adulthood, it is crucial to research its prevalence and effects since this behavioral disorder affects so many adults. Based on 12 studies that were published between 1996 and 2011 and used the DSM-IV criteria to define adult ADHD, Simon et al³ calculated that the combined prevalence of adult ADHD in the Western world was 2.5%.

Since only a few studies focus on adult ADHD in the Arab world to provide an accurate prevalence, this study was carried out with the aim of ascertaining the prevalence of ADHD among Saudi Arabian nationals, determining how participants' functional impairment is affected by their ADHD symptoms through using the Sheehan Disability Scale and determining the association between ADHD symptoms and any anxiety or depressive symptoms using the HADS scale.

Subjects and Methods

A descriptive cross-sectional study was carried out between January 2022 and March 2022 utilizing an online survey that was disseminated to the Saudi population through various social media platforms. The Research and Ethics Committee granted the study approval (KACST IRB number HAP-01-R-059). Each participant gave personal consent on the first page of the online survey. A convenient sample of adult participants was invited to take part in the study, and a total of 993 individuals were included in the final sample. No criteria for exclusion existed.

The study used a set of validated questionnaires with a total of 46 items that were based primarily on the study objectives. The questionnaires were written in English, translated from English into Arabic, and thereafter back into English by two bilinguals. It was amended by two psychiatrists, two neurologists, and one field

expert for both face validity and content validity. Thereafter, it was pilot-tested on 15 individuals to ensure comprehension and readability. The questionnaire had four sections, the first of which contained socio-demographic information, including age, gender, education, and household income per month. The adult ADHD Self-Report Scale (ASRS-v1.1), which consists of 18 items, was used in the second section to gauge individuals' levels of adult ADHD symptoms. The scale is divided into two parts: Inattention (6 items), which is frequently used for screening, and Hyperactivity-Impulsivity (12 items), which is frequently used for extra cues. The most inquisitive signs of adult ADHD can be understood by the first six questions²². Never, rarely, sometimes, often, and very often were given as answers to these questions. The cut-off score ≥ 20 was used to identify individuals who had severe ADHD symptoms²².

Sheehan Disability Scale (SDS) was the third section, which included three scales for measuring functional impairment in three major life domains: work/school, social life, and family life/home responsibilities²³⁻²⁵. For those with ADHD symptoms, participants rated their responses on each measure from 0 (no effect at all) to 10 (extremely affected). The overall rating ranged from 0 to 30, with higher ratings indicating considerable functional impairment. Scores above 5 on a subscale indicated that the subscale area could be impaired²⁶.

The Hospital Anxiety and Depression Scale (HADS) was the fourth section, which had 14 items in total and was separated into two subscales containing 7 items to measure anxiety and 7 items to measure depression. The score could be assessed based on the following ranges: 0-7 in the corresponding subscales were seen as normal, 8-10 for borderline, and 11 or beyond indicated most likely a clinical case^{27,28}. The anxiety subscale (HADS-A) had a specificity and sensitivity of 0.78 and 0.9, respectively. Whereas, the depression subscale (HADS-D) specificity was 0.79, and the sensitivity was 0.83²⁷.

Statistical Analysis

The data were analyzed using the Statistical Packages for Social Sciences (SPSS) version 26 (IBM Corp., Armonk, NY, USA). All categorical variables were shown as numbers and percentages. For the purpose of comparison, some variables were merged according to the subject matter. The relationship between ADHD among the socio-demographic characteristics, anxiety,

depression, and disability was analyzed using the Chi-square test²⁹. Significant results were then tested in a multivariate regression model to determine the significant independent factors associated with positive ADHD with a corresponding odds ratio as well as a 95% confidence interval. A *p*-value lower than 0.05 was used as a cutoff point to determine statistical significance.

Results

This study enrolled 993 Saudi residents, 48.4% were aged between 21-30 years, with females being dominant (77.8%). Nearly all were Saudis (94.9%) and mostly lived in the Central Region (57.9%). Over three-quarters (76%) were single, and nearly 60% were holders of bachelor's degrees. In addition, 52.7% indicated adequate family income.

In Figure 1, the prevalence of positive participants with ADHD symptoms was 46.6%, and the rest were normal (53.4%). Table I shows that the prevalence of positive ADHD was significantly more common among the younger age group (*p*-value =0.029) and those who were not married (*p*=0.007).

In Table II, it was observed that positive ADHD was more associated with an increasing

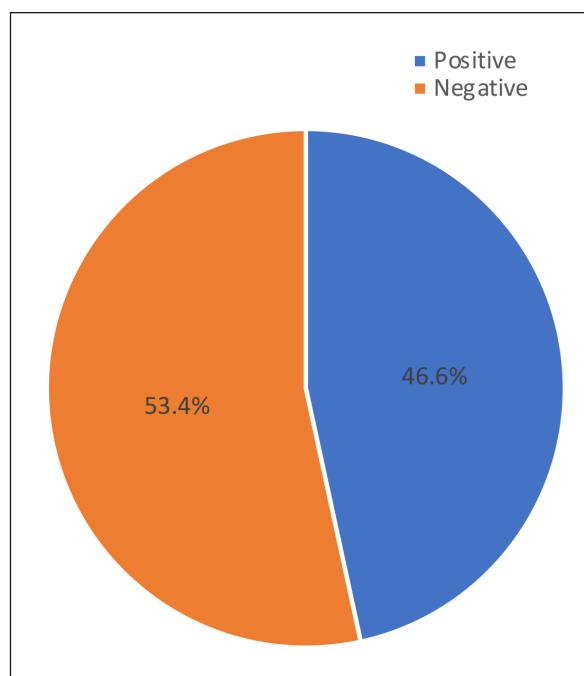


Figure 1. Prevalence of ADHD among the study population.

Table I. Relationship between ADHD and the socio-demographic characteristics of participants (n = 993).

Factor	Level of ADHD		χ^2	p-value [§]
	Positive N (%) (n = 463)	Negative N (%) (n = 530)		
Age group				
• ≤ 25 years	351 (75.8%)	369 (69.6%)	4.746	0.029**
• > 25 years	112 (24.2%)	161 (30.4%)		
Sex				
• Male	99 (21.4%)	121 (22.8%)	0.300	0.584
• Female	364 (78.6%)	409 (77.2%)		
Nationality				
• Non-Saudi	23 (05.0%)	28 (05.3%)	0.050	0.822
• Saudi	440 (95.0%)	502 (94.7%)		
Region of residence				
• Inside Central Region	270 (58.3%)	305 (57.5%)	0.060	0.807
• Outside Central Region	193 (41.7%)	225 (42.5%)		
Marital status				
• Never been married	370 (79.9%)	385 (72.6%)	7.171	0.007**
• Been married	93 (20.1%)	145 (27.4%)		
Educational level				
• Secondary or below	171 (36.9%)	190 (35.8%)	0.125	0.723
• Bachelor or higher	292 (63.1%)	340 (64.2%)		
Employment status				
• Student	290 (62.6%)	293 (55.3%)	5.621	0.060
• Employed	81 (17.5%)	107 (20.2%)		
• Unemployed	92 (19.9%)	130 (24.5%)		
Family income status				
• Adequate and saving	130 (28.1%)	150 (28.3%)	5.871	0.053
• Adequate	230 (49.7%)	293 (55.3%)		
• Not adequate	103 (22.2%)	87 (16.4%)		

[§]p-value has been calculated using Chi-square test. **Significant at p-value < 0.05 level.

level of depression ($p<0.001$), an increasing level of anxiety ($p<0.001$), an increasing impairment that disrupted school/work ($p<0.001$), or social life/leisure activities ($p<0.001$), or family life/home responsibilities ($p<0.001$), increasing days of absences ($p<0.001$) and increasing unproductive days ($p<0.001$).

When conducting a multivariate regression analysis (Table III), it was revealed that compared to subjects without depression, respondents who were in the borderline levels were predicted to increase the risk of having ADHD by at least 1.5 times higher (AOR=1.509; 95% CI=1.045-2.179; $p=0.028$) and increase to 1.7 times higher for clinically depressed patients (AOR=1.723; 95% CI=1.192-2.492; $p=0.004$). Compared to respondents without anxiety, those who were in the borderline levels were predicted to increase the risk of ADHD by at least 2.1-fold higher (AOR=2.109; 95% CI=1.490-2.985; $p<0.001$). Respondents who had no significant impairment that disrupted their/work/schoolwork were 1.77

times more likely to have ADHD (AOR=1.768; 95% CI=1.086-2.878; $p=0.022$). Respondents who had no significant impairment that disrupted their family life/home responsibilities were 2.09 times higher to be more associated with ADHD (AOR=2.093; 95% CI=1.225-3.576; $p=0.007$). Additionally, respondents with 1 to 2 unproductive days were 2.05 times more likely to have a symptom of ADHD (AOR=2.054; 95% CI=1.297-3.252; $p=0.002$) and 1.92 times higher risk for ADHD among those with 3 to 5 unproductive days (AOR=1.919; 95% CI=1.268-2.906; $p=0.002$).

Discussion

In this study, our aim was to find out how common adult ADHD is in the Saudi population. Based on their results on the ASRS-v1.1 scale, we categorized all participants (n=993; 77.8% females, 22.2% males) into two groups: Possible

Table II. Relationship between ADHD in terms of depression, anxiety and disabilities among study sample (n = 993).

Factor	Level of ADHD		χ^2	p-value [§]
	Positive N (%) (n = 463)	Negative N (%) (n = 530)		
• Normal	159 (34.3%)	275 (51.9%)	51.070	< 0.001**
• Borderline	122 (26.3%)	151 (28.5%)		
• Clinical case	182 (39.3%)	104 (19.6%)		
Anxiety				
• Normal	117 (25.3%)	267 (50.4%)	72.714	< 0.001**
• Borderline	106 (22.9%)	108 (20.4%)		
• Clinical case	240 (51.8%)	155 (29.2%)		
Sheehan scale				
The symptoms have disrupted your work/schoolwork				
• Not at all	51 (11.0%)	146 (27.5%)	59.579	< 0.001**
• No significant impairment	180 (38.9%)	224 (42.3%)		
• Extremely/significant impairment	232 (50.1%)	160 (30.2%)		
The symptoms have disrupted your social life/ leisure activities				
• Not at all	33 (07.1%)	116 (21.9%)	48.048	< 0.001**
• No significant impairment	198 (42.8%)	225 (42.5%)		
• Extremely/significant impairment	232 (50.1%)	189 (35.7%)		
The symptoms have disrupted your family life/home responsibilities				
• Not at all	35 (07.6%)	136 (25.7%)	68.141	< 0.001**
• No significant impairment	192 (41.5%)	223 (42.1%)		
• Extremely/significant impairment	236 (51.0%)	171 (32.3%)		
Day lost				
• Didn't become absent due to symptoms	227 (49.0%)	368 (69.4%)	50.909	< 0.001**
• 1-2 days per week	155 (33.5%)	128 (24.2%)		
• 3-5 days per week	81 (17.5%)	34 (06.4%)		
Days unproductive				
• Productivity has not decreased due to symptoms	142 (30.7%)	282 (53.2%)	77.655	< 0.001**
• 1-2 days per week	182 (39.3%)	192 (36.2%)		
• 3-5 days per week	139 (30.0%)	56 (10.6%)		

[§]p-value has been calculated using Chi-square test. **Significant at $p < 0.05$ level.

ADHD (n=463; 46.6%) (in need of additional diagnosis) and No ADHD (n=530; 53.4%). The average of our study's results could be overstated when compared to the global average⁶, which is 6.76%. The applied screening scale (ASRS-v1.1), which by design has limited specificity and only indicates the possibility of the condition rather than making a diagnosis, was responsible for the high prevalence³⁰.

Further, the sample distribution of our participants (more than two-thirds of our participants were younger than thirty years) could also explain this high prevalence. As accumulating evidence suggests⁶, the disease is more common in younger adults and gets less severe and prevalent when people get older. Nonetheless, our estimated results are comparable to those of other research^{6,31,32} that used the Self-Report scale (ASRS-v1.1) to test for ADHD.

Relation Between ADHD and the Social Demography

In our study, there was no sex-based difference in the apparent risk of ADHD, as both sexes had identical findings in the potential ADHD category, with a p-value of 0.584, which indicated an insignificant difference. Our results concur with prior research³³. Also, we discovered that only 93 (20.1%) of the 463 possible ADHD cases were married participants, suggesting a strong association between ADHD and single life ($p=0.007$). This result confirms the assumption that individuals with ADHD are less likely to enter into a relationship and make a commitment. Since the majority of students fall into the younger age bracket and adult ADHD incidence declines with age, as was previously noted, it was expected that students would have the highest incidence of the disorder (n=290, 62.6%). However, when we ex-

Table III. Multivariate regression analysis to determine the significant independent predictor associated with positive ADHD (n = 993).

Factor	AOR	95% CI	p-value
Age group			
• ≤ 25 years	Ref		
• > 25 years	1.021	0.653-1.597	0.926
Marital status			
• Never been married	Ref		
• Been married	0.928	0.579-1.486	0.755
Depression			
• Normal	Ref		
• Borderline	1.509	1.045-2.179	0.028**
• Clinical case	1.723	1.192-2.492	0.004**
Anxiety			
• Normal	Ref		
• Borderline	2.109	1.490-2.985	< 0.001**
• Clinical case	1.181	0.820-1.700	0.372
Sheehan scale			
The symptoms have disrupted your work /schoolwork			
• Not at all	Ref		
• No significant impairment	1.768	1.086-2.878	0.022**
• Extremely/significant impairment	1.265	0.903-1.771	0.172
The symptoms have disrupted your social life/leisure activities			
• Not at all	Ref		
• No significant impairment	1.161	0.662-2.037	0.602
• Extremely/significant impairment	0.779	0.558-1.088	0.143
The symptoms have disrupted your family life/home responsibilities			
• Not at all	Ref		
• No significant impairment	2.093	1.225-3.576	0.007**
• Extremely/significant impairment	1.033	0.735-1.451	0.852
Day lost			
• Did not become absent due to symptoms	Ref		
• 1-2 days per week	1.634	0.986-2.707	0.057
• 3-5 days per week	1.256	0.754-2.093	0.381
Days unproductive			
• Productivity has not decreased due to symptoms	Ref		
• 1-2 days per week	2.054	1.297-3.252	0.002**
• 3-5 days per week	1.919	1.268-2.906	0.002**

AOR-Adjusted Odds Ratio; CI-Confidence Interval. **Significant at p-value < 0.05 level.

amined employment in the participants who may have had ADHD, we identified that 81 (17.5%) were employed compared to 92 (19.9%) who were unemployed, which is not quite as significant as observed in earlier work by Able et al³⁰ and Biederman et al³⁴, which demonstrate that adults with ADHD have relatively low rates of full-time employment and a high rate of unemployment.

Income variation did not significantly increase the probability of adult ADHD in our data. In line with our findings, a case-control study by Able et al³⁰ suggested that participants with undiagnosed ADHD were less likely to be high earners and more likely to fall into low-income categories. Moreover, a study by Goodman³⁵ found that adult ADHD patients had a considerable prevalence of poor income.

Consequences of ADHD

In the present study, we sought to ascertain how participants' quality of life was affected by their ADHD symptoms (Table III). On the Sheehan scale, half of the possible ADHD group (n=232, 50.1%), said that the work/schoolwork was significantly impeded by ADHD symptoms, with just 51 (11%) reporting no effect at all. These findings are corroborated by two studies, Able et al³⁰ and Quintero et al³⁶, which indicate a considerable impact of ADHD on work/school performance. Further, based on our data, the potential ADHD group was shown to have a higher absenteeism rate due to ADHD symptoms, with n=81 (17.5%) admitting 3-5 days per week and n=155 (33.5%) admitting 1-2 days per week, which might be seen as a factor in work/school failure.

Our results support those of other research^{30,34}. A loss of productivity throughout the majority of the weekdays was also noted by the possible ADHD group (n=182, 39.3%), which is thought to be another factor in the impairment. The obvious reason for such impairment may be inattention³⁴. Nevertheless, Ogg et al³⁷ affirmed that impulsivity plays a larger impact in adult ADHD work challenges than inattention. Adult ADHD social and family impairment was noted to be significant in a number of academic studies³⁴.

The results of this study indicate that among individuals in the potential ADHD group, there was a social/family impairment in 232 (50.1%) and a family/home responsibility impairment in 236 (51.0%). As a result, with a *p*-value of 0.001, ADHD symptoms showed a significant effect on life quality.

ADHD Relation with Depression and Anxiety

The aim of our study was to determine whether there was an association between ADHD symptoms and depression and anxiety using the HADS scale. We identified that more than half of the 304 possible ADHD group (65.6%) displayed depressive symptoms, ranging from borderline to most likely a clinical condition. These results are corroborated by earlier research^{11,38}, showing a strong relationship between the intensity of ADHD symptoms and depressed symptoms in adults with a clinical diagnosis of ADHD.

The link between depression and ADHD can be explained by the stressful environment connected to the ADHD symptoms, such as strained relationships³⁹ and low academic achievement⁴⁰, which increase the likelihood of depression. It could also be explained by the genetic overlap between depression and ADHD, which has been proved by numerous studies⁴¹. For instance, a recent Genome-Wide Association Study (GWAS)⁴¹ of ADHD reported an extensive genetic correlation of ADHD with other psychiatric disorders, the strongest of which was with depression (major depressive disorder $r_g = 0.42$, depressive symptoms $r_g = 0.45$).

In terms of the likelihood that anxiety and ADHD co-occur, 346 (74.7%) subjects of the group who might have ADHD displayed anxiety symptoms that ranged from borderline anxiety to very likely a clinical condition. According to past research⁴¹, which is consistent with our findings, individuals with ADHD are more likely to experience anxiety than individuals without the

disorder. They also appear to experience anxiety symptoms that are more intense^{16,42}. However, our study found a higher percentage of potentially ADHD-afflicted people with anxiety symptoms than has previously been reported^{16,43}. The Self-Reported Questionnaire and the screening tools we utilized are likely to account for this high percentage.

Limitations

This study has many limitations that may influence the interpretation and generalization of its findings. Firstly, the small sample size may provide less significant results. Second, the measure we used to diagnose the possible adult ADHD group was not a structured psychiatric interview, rather, we used a self-reported screening survey, which only indicated the possibility of the condition. Further, no clinical assessment was done to confirm the diagnosis. However, ASRS-v1.1 is known³¹ to be a valid and reliable screening tool for the estimation of adult ADHD prevalence. Third, data regarding the other co-morbid conditions, and drug and alcohol use were not collected. Finally, medication history for both adult ADHD and its comorbid condition were not collected.

Conclusions

This study indicated that 46.6% of adults included in the study had a possibility of having ADHD. ADHD patients either experience anxiety or depression at 51.8% and 39.3%, respectively. The correlation between ADHD and the occurrence of depression or anxiety demonstrates a significant positive correlation between the risk of having ADHD and the presence of clinical depression or anxiety. The correlation between functional impairment using the Sheehan disability score and ADHD reveals a significant positive relationship between social and familial obligations, poor work/school performance, and the risk of having ADHD.

Conflict of Interest

The authors declare that they have no conflict of interests.

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Ethics Approval

The Research and Ethics Committee granted the study approval (KACST IRB number HAP-01-R-059).

Informed Consent

All participants gave their consent on the first page of the online survey.

Authors' Contribution

Conceptualization: Norah Alharbi, Kayan Fehan Alotaibi; literature review: Ghaida Khalid Althaqel, Nojoud Yahya Alasmari, Ahad Fayed Alahmari; Data acquisition: Ohood Yahya Alasmari, Mashaal Saeed Alshahrani, Lujain Abdullah Alghamdi; Data cleaning: Hajar Ahmad Alrashed, Nouf Ayman Shugair; Methods: Norah Alharbi, Kayan Fehan Alotaibi; Data Analysis: Norah Alharbi; manuscript write up: Norah Alharbi; Manuscript review: Ohood Yahya Alasmari, Mashaal Saeed Alshahrani, Lujain Abdullah Alghamdi, Hajar Ahmad Alrashed, Nouf Ayman Shugair.

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Availability of Data and Materials

The data will be made available from the corresponding author upon request.

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