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Original Article

## Comparing levels of psychological stress and its inducing factors among medical students



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### المخلص

**أهداف البحث:** تهدف هذه الدراسة إلى تحديد ومقارنة مستويات الإجهاد النفسي لدى طلاب الطب من السنة الأولى إلى السنة الخامسة، ومعرفة العوامل المسببة للإجهاد.

**طرق البحث:** أجريت هذه الدراسة المستعرضة على ٤٦٨ من الإناث. استخدمت الدراسة أداة قياس الإجهاد النفسي "كسلر ١٠"، واستبانة حول مختلف العوامل التي تسبب الإجهاد.

**النتائج:** أبلغ ٦٧.٩٪ من الطالبات عن وجود الإجهاد الفسيولوجي لديهن. وبلغت نسبة الطالبات بدون إجهاد، وبإجهاد خفيف، وإجهاد معتدل، وإجهاد شديد ٣٢٪ و ٢٤٪ و ٢٢٪ و ٢١.٨٪ على التوالي. وكان أعلى معدل انتشار للإجهاد الفسيولوجي عند طالبات السنة الأولى (٨٢.٦٪). وانخفضت درجات التوتر بشكل ملحوظ مع زيادة في السنة الدراسية، باستثناء السنة الأخيرة. وتضمنت متغيرات الدراسة السنة الأولى من الدراسة الطبية (٠.٠٢٢)، والإجهاد الأكاديمي (٠.٠٠١)، ووجود مشكلة جسدية (٠.٠٠١) والزواج (٠.٠٠٢)، وكانت عوامل الخطر المستقلة لارتفاع التوتر الملحوظ (درجة كسلر  $10 > 24$ ). واستشار ١١.١٪ من الطالبات طبيب فيزيائي، في حين أن ٣.٤٪ من الطالبات يتناولن بعض الأدوية لعلاج الإجهاد.

**الاستنتاجات:** خلصت الدراسة إلى أن السنة الأولى من الدراسة الطبية، والإجهاد الأكاديمي، ووجود مشكلة جسدية والزواج هي عوامل خطر مستقلة لارتفاع نسبة انتشار الإجهاد النفسي. نوصي بأن يكون فحص الإجهاد النفسي إلزامياً في كليات الطب. ويفضل أن يتكرر كل ستة أشهر، كما يجب تقديم المشورة لمن لديه إجهاد نفسي، وتقديم خدمات الصحة النفسية والمتابعة السليمة.

**الكلمات المفتاحية:** طلاب الطب؛ الضغط النفسي؛ عوامل الخطر

### Abstract

**Objective:** This study aimed to determine and compare degrees of psychological stress and inducing factors thereof among first to fifth year medical students (MS).

**Methods:** This cross-sectional study was conducted on 468 female MS. We used the Kessler 10 Psychological Distress Inventory consisting of questions on a range of stress-inducing factors.

**Results:** A total of 67.9% students reported physiological stress. The percentage of MS without stress and with mild, moderate, and severe stress was 32%, 24%, 22%, and 21.8%, respectively. The highest prevalence of physiological stress was found among first-year students (82.6%). Stress scores significantly decreased with advancement in the year of study, except for the final year ( $p = 0.001$ ). We found that the first year of medical studies (0.022), academic stress (0.001), the presence of a physical problem (0.001), and being married (0.002) were independent risk factors for high perceived stress (HPS), as shown by K10 scores  $>24$ . A total of 11.1% students consulted a psychiatrist, whereas 3.4% admitted taking some medication for stress.

**Conclusion:** This study infers that the first year of medical studies, academic stress, the presence of a physical problem, and being married are independent risk factors for HPS. We recommend mandatory stress screening for MS in all medical colleges. Ideally, the screening should be repeated every six months and students identified as having HPS should be provided with counselling, mental health services, and a proper follow-up.

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**Keywords:** Academic stress; Medical students; Psychological stress; Risk factors; Student counselling

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## Introduction

The goal of medical education is to produce knowledgeable, skilful, and professional physicians.<sup>1</sup> In an attempt to accomplish these ambitions, life as experienced by students during medical training is tough and demanding. An extensive medical curriculum, a heavy academic load, high academic expectations, long working and study hours, sleep deprivation, and tough competition can result in high stress levels among medical students (MS).<sup>2–4</sup> High rates of depression, anxiety, stress, and burnout have been reported in MS, which can negatively affect their mental health, motivation, academic performance, learning and cognition, and can even lead to suicide attempts.<sup>5–7</sup>

The prevalence of psychological stress is much higher in MS, compared to non-medical students and the general population.<sup>7–9</sup> A recent review of 195 studies involving 129,000 MS in 47 countries reported that almost a quarter of MS have depression, whereas 11.1% show suicidal behaviours.<sup>7</sup> Academic problems are considered to be the most prevalent stressor for MS.<sup>10</sup> Most MS indicate that they are experience continuous and chronic stress due to an overloaded curriculum and frequent examinations.<sup>11</sup> Moreover the medical school environment is typically rigid, authoritative, and competitive, thereby adding to the pressure experienced by MS.<sup>12</sup>

Mental health worsens after entry into medical school, and remains poor throughout the study course (Years 1–5).<sup>13</sup> However, findings regarding the relationship between the year of study and the severity of psychological stress are still controversial. Rotenstein et al. documented a relatively constant prevalence of stress in MS throughout the course of medical studies, whereas Bassols et al. observed a higher prevalence of stress among first-year (30.8%), as compared to final-year MS (9.4%).<sup>14</sup> Abdulghani et al. also concluded that first-year students have the highest stress levels, which decrease with the advancement of study years, except in the final study year.<sup>4</sup> In contrast, other authors have reported a notable rise in stress scores with progressing years of study.<sup>5,15,16</sup> Ascertaining the time during which students are most susceptible to psychological stress and providing better support during this period, can drastically improve their mental health levels and academic performance.<sup>17</sup>

Inconclusive findings about the effect of year of medical studies on stress levels led to the conceptualisation of the current study. The study aimed to determine and compare perceived psychological stress levels across study years (Years 1–5), using the Kessler 10 Psychological Distress instrument.<sup>18</sup> We also tried to explore the possible relationship between high stress levels and age, marital

status, family size, and the presence of a physical problem. This is because the latter stressors have been overlooked or neglected in most existing studies. This study will also highlight trends in MS' consultation of psychiatrists. The results of the present study may provide better insight into risk factors for psychological stress among MS, which can be helpful in the planning and implementation of the most appropriate strategies for improving mental health services in medical universities all over the world.

## Materials and Methods

This cross-sectional study was conducted in Imam Abdulrahman Bin Faisal University, Dammam, KSA, from January 2018 until December 2018.

The calculated sample size was 228. Sample size calculation was done using open-source epidemiologic statistics for public health tools software (accessed at: <http://epitools.ausvet.com.au/content.php?page=1Proportion&Proportion>). The calculation was based on the estimated prevalence of psychological stress among medical students and a target population size of 620 (which was the total number of female MS on IAU campus), with significance set at 0.05 (5%), and the confidence interval at 0.95 (95%).

Data were collected from female MBBS students across five academic-year levels through convenience sampling (total: 468, 1st year: 92, 2nd year: 113, 3rd year: 90, 4th year: 84, and 5th year: 89). The response rate was 75%, as 468 out of 620 students volunteered to complete the questionnaire. So, this study achieved a sample size higher than the initial target.

The measurement tools used were the **K10** and a self-administered questionnaire, which was developed by the author, based on previous studies. The questionnaires were validated by two medical education experts. This was followed by pilot-testing and a reliability analysis. The reliability and validity of the questionnaires was determined by assessing test-retest reliability, which was found to be 0.802. Thirty students were asked to complete the same questionnaire, with a two-week gap in-between the assessments, to determine consistency in responses.

The main measures in the questionnaire were:

**1: Personal data:** These included information regarding various factors that can act as stressors, including age, marital status, physical problems, academic factors, and year of MBBS studies.

A *physical problem* was considered present if a student had any medical illness (for at least the last four months), affecting his or her daily life activities.

*Academic stress* was present if a student indicated being stressed due to any of the following reasons:

- A heavy academic load
- High academic expectations
- Anxiety about the future due to tough competition

**2: Kessler 10 Psychological Distress instrument (K10):** Various types of questionnaires have being used to identify psychological stress in medical students, including the Perceived Stress Score 10<sup>19</sup>, Zung's Self-Rating Scale for Depression,<sup>20</sup> Beck's Depression Inventory,<sup>21</sup> and others.

We used the Kessler 10 Psychological Distress instrument (K10) because of its high reliability and validity.<sup>18</sup> This instrument has also been used by the World Mental Health Survey of the World Health Organization.<sup>22,23</sup>

The K10 is a 10-item questionnaire that measures stress levels, using questions on anxiety and depressive symptoms that a person has experienced during the last month. Numbers are assigned to 10 response options for items, which are then added up to yield a total score. Scores range from 10 to 50. Based on these scores, subjects are classified as having mild, moderate, and severe stress, as shown below:

- <20 indicates no stress
- 20–24 indicates mild stress
- 25–29 indicates moderate stress
- ≥30 indicates severe stress<sup>7</sup>

Participants were further categorized into low perceived stress (LPS) and high perceived stress (HPS) groups, as shown below:

- LPS Group = K10 scores <24
- HPS Group = K10 scores ≥24

#### Data collection

A special request was forwarded to the college's administration, to arrange for 20-min sessions in each class, so as to collect the data for this study. Written consent was obtained from all those who were willing to participate in the study. Prospective participants were briefed for 10 min; this entailed an explanation of the details of the study tools, the various terminologies used in the questionnaires, and the objectives of the study. As the study participants were medical students, they understood and responded to all the instructions well. In order to avoid the effect of examination stress, the questionnaires were completed no later than two weeks before any major class test or examination.

Data were analysed through the IBM SPSS software version 20. Descriptive analyses were used to calculate the frequency distributions of various study variables including age groups, residence, marital status, family size, physical problems, and years of study.

Based on the K10 scores, stress was categorized into no, mild, moderate, and severe stress categories. The frequencies and distribution of students into these categories were calculated for each year of study. A comparison of mean K10 scores across study-year levels was conducted using one-way ANOVA.

Students with no and mild stress were assigned to the LPS (low perceived stress) group, whereas those with moderate and severe stress were assigned to the HPS (high perceived stress) group. Binary logistic regression analysis was used to compare participants' stress levels, (LPS) and (HPS), in relation to the various study variables. Multiple logistic regression analysis was conducted to identify independent risk factors of stress. A 95% confidence interval was calculated for both the adjusted and unadjusted odds ratios. P-value <0.05 was considered statistically significant.

## Results

A total of 468 (75%) out of 620 students completed and returned the questionnaires. Participants' mean age was 22.1 (±1.5) years. The frequencies and distribution of various study variables are shown in Table 1. With regard to marital status, 13.1% of participants were married, 1.4% of whom were in their first year of study, and 4%, in their fifth year of study.

In total, 47.5% of students reported having academic stress. The most prevalent academic problem among first-year students was a heavy academic load, whereas fifth-year students reported 'anxiety about the future due to tough competition' as the main cause of their stress. The percentage of students who had to consult a psychiatrist for their stress management was 11.1%, whereas 3.4% of the students reported that, at the time of the study, they were on some medication for stress/anxiety/depression management.

Table 2 shows a comparison of the mean K10 scores of students in each year of study. The mean K10 score for

**Table 1: Frequencies and distribution of the study variables for 468 subjects.**

Stress inducing factors	Frequency (n)	Percentage (%)
<b>Age</b>		
≤20	114	24.4%
21–25	354	75.6%
<b>Family size</b>		
≤5	219	46.8%
>5–8	249	53.2%
<b>Marital Status</b>		
Single	403	86%
Married	65	13.9%
<b>Students with physical problems</b>	75	16%
<b>Students with academic problems</b>	223	47.5%
<b>Year of study</b>		
1st year	92	19%
2nd year	113	24.1%
3rd year	90	19.2%
4th year	84	17.9%
5th year	89	19%

**Table 2: A comparison of mean K10 scores across different years of study using one-way ANOVA.**

	Number of students	Mean K10 score (SD)	95% CI	p-value*
1st year	92	27.44 (8.7)	25.6–29.2	0.001 <sup>a</sup>
2nd year	113	22.96 (8.1)	21.4–24.4	
3rd year	90	23.08 (8.8)	21.2–24.9	
4th year	84	22.97 (8.4)	21.1–24.8	
5th year	89	24.62 (8.7)	22.7–26.4	
All five years	468	24.18 (8.7)	23.3–24.9	

\* p-value ≤0.05 is considered statistically significant.

<sup>a</sup> Means of K10 scores are significantly higher among first-year students, compared to those in other years of study.

first-year students was 27.4, which was significantly higher than that of students in other years of study "p-value = 0.001"). A decrease in the K10 scores was observed with an increase in the year of study, except for the final year.

A total of 67.9% of students reported physiological stress, 21.8% of whom were severely stressed. First-year students had the highest prevalence of physiological stress (82.6%), followed by fifth-year (69%), second-year (64.6%), fourth-year year (63%), and third-year students (60%) (Table 3). The odds ratios (ORs) for psychological stress were 1.8 (first year), 0.75 (second year), 0.68 (third year), and 0.71 (fourth year) when the fifth year was used as a reference category. This indicated that the OR for psychological stress declined with progression in the year of study.

Univariate logistic regression analysis revealed that factors increasing the OR of HPS are age <20, year of study (first year), academic stress, physical problems, and marriage. Having a large family was not associated with an increased risk of stress (Table 4). The study variables, including the first year of medical studies (0.022), academic stress (p < 0.0001), the presence of a physical problem (p < 0.0001), and being married (p < 0.002) were found to be independent significant risk factors for HPS (Table 5).

*Interview sessions*

After data analysis, the students found to experience severe distress (K10 scores >30) were further interviewed in-depth. Special permission was obtained from the college administration and Deanship of Scientific Research.

Five major interview sessions were held with five groups of students (one group from each year of study). Open-ended questions were asked to probe for major sources of stress. Separate sessions with individual students were held for subjects who were not comfortable with discussing their problems openly in group settings.

All these students were then referred to the college's counselling department for further evaluation and follow-up.

The major issues faced by participants in these groups have been highlighted in Table 6.

**Table 4: A comparison of stress levels in relation to various study variables using binary logistic regression analysis (univariate analysis).**

Stress-inducing factors	Stress		OR (95% CI)	p-value
	HPS K10 scores >24	LPS K10 scores <24		
Age <20	69	45	1.6 (1.04–20.5)	.03
Number of family members ≥5	123	126	0.8 (0.6–1.2)	.3
Marital status (married)	51	14	4.04 (2.2–7.5)	.001
Physical problems	67	8	10.4 (4.9–22.3)	.001
Academic problems	192	31	24.2 (14–39)	.001
<b>Years of study</b>				
1st year	63	29	1.8 (0.29–0.98)	.046
2nd year	53	60	0.75 (0.75–2.31)	.322
3rd year	40	50	0.68 (0.81–2.63)	.205
4th year	38	46	0.71 (0.77–2.57)	.254
5th year	48	41	Reference value	

p-value <0.05 is statistically significant.

With regard to years of study, the final year was used as a reference value, thereby indicating that 1st year, 2nd year, 3rd year, and 4th year students have a 1.8, 0.75, 0.68, and 0.71 times increased risk of having HPS, compared to 5th year students.

**Table 5: Independent risk factors for high perceived stress (multivariate analysis).**

Stress inducing factors	Adjusted OR (95% CI)	p-value
Marital status	0.246 (0.10–0.58)	0.002*
Academic problems	27.6 (15.4–49.6)	0.0001*
Physical problems	16.7 (5.7–48.6)	0.0001*
<b>Year of study</b>		
1st year	9.8 (0.02–0.46)	0.022*
2nd year	3.3 (0.12–0.76)	0.122
3rd year	3.02 (0.12–0.86)	0.126
4th year	1.5 (0.24–1.7)	0.248

\* p-value <0.05 is statistically significant.

**Table 3: The prevalence of mild, moderate, and severe stress in each year of study.**

	No stress (K10 scores <20)	Number of students with mild stress (K10 scores 20–24)	Number of students with moderate stress (K10 scores 25–29)	Number of students with severe distress (K10 scores >30)	Total number of students with stress
1st year	16 (17%)	16 (17.4%)	33 (35.9%)	27 (29.3%)	76 (82.6%)
2nd year	40 (35.4%)	31 (27.4%)	23 (20.4%)	19 (16.8%)	73 (64.6%)
3rd year	36 (40%)	23 (25.6%)	9 (10%)	22 (24.4%)	54 (60%)
4th year	31 (36.9%)	24 (28.6%)	13 (15.5%)	16 (19%)	53 (63%)
5th year	27 (30.3%)	19 (21.3%)	25 (28.1%)	18 (20.2%)	62 (69%)
All five years	150 (32.1%)	113 (24.1%)	103 (22%)	102 (21.8%)	318 (67.9%)

**Table 6: Major problems identified among severely distressed students through interview sessions.**

Year of study	Number of students with severe distress (K10 scores >30)	Major problems faced by each group of severely distressed students
1st year	27/92 (29.3%)	<ul style="list-style-type: none"> <li>• Unable to cope with the excessive burden of studies and frequent assessments.</li> <li>• Not satisfied with own grades.</li> <li>• Having to study for more than 10 h per day, but still not getting good marks.</li> <li>• Having no time to socialise.</li> </ul>
2nd year	19/113 (16.8%)	<ul style="list-style-type: none"> <li>• Academic stress</li> <li>• Not satisfied with own grades.</li> </ul>
3rd year	22/90 (24.4%)	<ul style="list-style-type: none"> <li>• Academic stress</li> <li>• Students with physical problems feel physically exhausted and mentally depressed because of their illness. Their class attendance, studies, and assessments were negatively affected. Few mentioned that they might have to drop the semester because of their illness.</li> </ul>
4th year	16/84 (19%)	<ul style="list-style-type: none"> <li>• Not satisfied with own grades.</li> <li>• Married students had difficulties balancing the demands of medical studies with those of married life.</li> <li>• Pregnant students were stressed, as medical colleges do not provide maternity leave or daycare services.</li> <li>• Students with physical problems had similar issues (to those mentioned by 3rd year students)</li> </ul>
5th year	18/89 (20.2%)	<ul style="list-style-type: none"> <li>• Uncertainty in deciding on future career.</li> <li>• Increasing competition.</li> <li>• Saturation in most medical fields and difficulty getting enrolled in various postgraduate programmes.</li> <li>• Lack of sleep due to clinical rotations.</li> <li>• Having no time to socialise.</li> <li>• Married and pregnant students had similar issues (as those mentioned by 4th year students).</li> </ul>

## Discussion

MS report high levels of stress at graduation. The overall prevalence of stress in the present study (67.9%) is consistent with that in studies conducted in Riyadh (63.7%),<sup>4</sup> Iran (61.3%) (26), and Thailand (61.4%).<sup>25,26</sup> However, stress prevalence in the current study was higher, when compared to that in studies conducted in America (45%),<sup>16</sup> Egypt (43.7%),<sup>27</sup> Malaysia (41.9%),<sup>21</sup> the United Kingdom (31.2%),<sup>28</sup> and Sweden (12.9%).<sup>29</sup> This variation could be due to differences in the diagnostic instruments used in the

other studies,<sup>4,6-8</sup> or due to real differences resulting from differences in the medical school environments, curricula, teaching and assessment methodologies, and the availability of academic counselling services.<sup>30</sup> One of the possible explanations for the high stress prevalence in the present sample could be that our study population comprised only females; various authors have stated that female MS are more stressed, compared to male MS.<sup>2-7</sup>

A noteworthy finding of this study was that the stress scores were highest in the first year of study and decreased significantly with progression in the year of study. Almost similar results have been reported by other authors.<sup>4,14,31</sup> High stress levels in the first-year group may be due to the nature and overload of the work inherent to the medical course. In fact, entering medical school is associated with numerous challenges, beginning with a substantial burden associated with one's studies, frequent assessments, a high cut-off point, a competitive environment, and high expectations by parents and society.<sup>32</sup> As the course progresses, MS gradually develop coping mechanisms and strategies to adapt to the new environment and medical studies, thereby reducing their stress levels.<sup>33</sup> This is in contrast with other studies showing that stress levels progressively increase with advancing years of study,<sup>5,15,16</sup> especially in the transition from basic to clinical science training.<sup>34</sup> This finding could be due to the fact that our study was cross-sectional, showing an increase in stress according to progression in study years, by assessing different student groups. Therefore, we cannot be sure of an actual decrease in the stress levels. Moreover, these variations and inconsistencies could be due to differences in the educational and social environments of the medical students.<sup>11,16</sup>

The present study found academic stress to be the strongest risk factor for HPS. This compelled us to arrange a series of interviews to identify stress-causing concerns among subjects who had obtained academic stress scores  $\geq 30$ . Most of the first-year students indicated that they were not coping with the excessive burden of studies and frequent assessments; they were also not satisfied with their grades. Few of these stated that they studied for more than 10 h a day, but still did not get good marks. Some mentioned that they felt depressed, as they did not have time to socialize, due to academic workload. Interviewing final-year students revealed that increasing competition, saturation in most medical fields, uncertainty in deciding on their future specialisation fields, and lack of sleep due to clinical rotations were the main academic stressors for this group. Almost similar concerns have been reported in other medical universities.<sup>7,10,11</sup> Jafri et al. highlighted that 52.4% of MS in Medical Colleges of Karachi were stressed, 75.6% of whom attributed their high stress levels to academic pressures.<sup>8</sup>

HPS was independently associated with physical problems. A total of 16% of the study participants had various physical problems. Most of these students mentioned that they felt physically exhausted and mentally fatigued because of their illness. Their class attendance, studies, and assessments were also being negatively affected. Few mentioned that they might have to drop the semester because of their illness. Other authors have also reported that continuing medical studies with a persistent physical problem is quite challenging and stressful.<sup>4,15</sup>

The present study showed no relationship between family size and stress, but being married was identified as an independent risk factor for HPS. Although limited data are available in this regard, it has been reported that an increase in the age of MS (the American Association of Medical Colleges reported that more than 10% of MS are aged  $\geq 27$  years) is associated with an increase in the number of married MS.<sup>35</sup> In the present study group, 13.6% of participants were married. Further interviewing married students revealed that getting married during the course of medical studies resulted in various problems, including the following: difficulty balancing the demands of medical studies with those of marriage, financial difficulties among young couples, and extra challenges for students who become pregnant, as medical colleges do not provide maternity leave or daycare services. Students with children suggested that the government should assist them by providing special daycare services at the university.

Our study found that 21.8% of MS had severe stress, but that only 11.1% of those had visited a psychiatrist. MS with depression have been shown to feel guilty and reluctant to share their emotional states with others, with serious consequences.<sup>36</sup> A recent review by Rotenstein et al. revealed that almost 27.2% of MS had severe stress, whereas only 15.7% had consulted a psychiatrist; this led to an increase in suicidal ideation to almost 11.1%. This underscores the need for timely and effective preventive measures.<sup>7</sup> Psychological stress during medical studies affects not only academic performance, but is also likely to predict mental health problems in later years. Therefore, the relevant authorities should implement early identification and preventive measures to prevent future complications.

#### Limitations of the study

The study sample comprised female MS only, which meant that gender comparisons could not be conducted. Moreover, psychological stress was measured through a self-reported questionnaire, which may have resulted in bias because of inaccurate responses by the students.

#### Conclusions

This study concludes that the first year of medical studies, academic stress, the presence of a physical problem, and being married are independent risk factors for HPS.

This cross-sectional study showed the highest prevalence of physiological stress among first-year MS, and the stress scores decreased significantly with progression in the year of study, except for the final year. In order to confirm these findings, further longitudinal studies with larger sample sizes comprising students and faculty from multiple medical universities, should be carried out.

#### Recommendations

We recommend that stress screening should be mandatory for MS in all the medical colleges. Students obtaining high stress scores should be provided with counselling and mental health services, along with proper follow-ups. Mental health awareness lectures and seminars should be added as a

mandatory component of the first-year curriculum. Moreover, fifth-year MS should be provided with advisory services entailing career counselling and on best future opportunities and the availability of, and enrolment criteria for various postgraduate programmes.

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#### Conflict of interest

The authors have no conflict of interest to declare.

#### Ethical approval

Ethical approval for the study was given by the Deanship of Scientific Research College of Medicine, Imam Abdulrahman Bin Faisal University Dammam (IAU), Grant number 2014285

#### Authors contributions

NR Conceptualised and designed the study, conducted the research, and wrote the initial and final drafts of the article. LI Analysed and interpreted the data, compiled the data, and drafted the manuscript. RL Collected and analysed the data, compiled the results, and revised the manuscript critically for important intellectual content. AA Participated in the conceptual design of study, interpretation of results, data analysis, and revised the manuscript critically for important intellectual content. SW Collected the research data, organised the data, and revised the manuscript critically for important intellectual content. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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