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Mental health status among university students during the transition period from high school to university in Lebanon: a cross-sectional study

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Abstract

Background The transition from high school to university is a critical life stage associated with heightened vulnerability to mental health challenges. Despite global recognition, there is limited research on the psychosocial risks faced by first-year university students in Lebanon, a region further burdened by socio-economic and political instability.

Objective To assess the mental health status of first-year university students in Lebanon, focusing on the prevalence and intensity of mental health challenges such as anxiety, depression, and stress during the transitional period.

Methods This cross-sectional study involved 1,024 students from multiple Lebanese universities during the 2023-2024 academic year. Data were collected via a self-reported questionnaire and the General Health Questionnaire-28 (GHQ-28), that assesses mental health across four key dimensions: somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression. Descriptive statistics, chi-square tests and *P*-values were used to analyze demographic, behavioral, and mental health data.

Results A significant gender difference in employment ($\chi^2 = 18.81$, $p = 0.00086$) was found. The GHQ-28 survey results indicate that 64.3% of university students experience psychological distress, with higher prevalence among females (67.3%) than males (60.8%) ($\chi^2 = 4.42$, $p = 0.035$). 31.7% reported sleep disturbances, 27.9% felt overwhelmed, and 33.2% experienced hopelessness. 18.8% had thoughts of self-harm, and 3.1% considered ending their life. The GHQ-28 scores indicate a high prevalence of mental health challenges, taking a score of 24 as a cut off score.

Conclusions The study highlights the urgent need for targeted mental health interventions for Lebanese university students, addressing both universal and region-specific challenges. The findings emphasize the importance of early intervention, increased access to mental health resources, and promoting systemic changes to improve overall student well-being.

Keywords Mental health, University students, Transitional period, Anxiety, Depression, Stress, GHQ-28, Psychological distress, Lebanon

Introduction

Background

The rise in high-risk behaviors, psychological distress, and mental health issues among first-year university students has become a global concern due to its considerable

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effects on long-term mental well-being, quality of life, and academic success [1].

Transitioning from high school to university is one of the most demanding phases in a young adult's life, involving changes in identity, finances, and social interactions [2]. These transitions have been consistently associated with increased vulnerability to mental health issues, with estimates suggesting that 15.6% of undergraduate students and 13% of graduate students will face depression and anxiety at some point in their lives [3]. A further indication of this trend is seen in a survey over 3,100 graduate students revealed that 44.7% reported experiencing significant emotional or stressful challenges in the previous year [4].

A study observed that the percentage of first-year students experiencing psychological distress rose from 35% in 2016 to 55% in 2020 [5]. Likewise, another study found a 50% increase in depression rates among first-generation college students in the U.S. during the COVID-19 pandemic [6].

In the Middle East and North Africa (MENA) region, a study from 2017 in Egypt highlighted gender differences in mental health outcomes, showing that young women had poorer mental health than their male counterparts, with academic performance negatively affecting mental health. Notably, 27% of participants reported a decline in their mental health over the study period [7].

Mental health plays a vital role in overall well-being during this time. More recently, a national Egyptian study revealed that 68% of university students experienced moderate to severe psychological distress [8]. Consistent with this, research in Egypt indicated that academic stressors and life stage transitions were major factors contributing to moderate depression among these students [9].

Zooming into Lebanon, a recent study highlighted the significant role of health behaviors and psychological distress in shaping academic outcomes among Lebanese university students. Their findings revealed that students with regular breakfast consumption and lower psychological distress were more likely to achieve better academic performance, while unhealthy dietary habits and high levels of stress adversely affected academic success [10].

Additionally, the 2022 Psychopathology in Children and Adolescents in Lebanon Study is the first national survey to estimate the prevalence of psychiatric disorders among Lebanese youth. This survey found that 32.7% of children and adolescents screened positive for at least one psychiatric disorder, with anxiety (22.58%) and PTSD (19.72%) being the most common. Risk factors included low family income, chronic illness, bullying, and poor academic performance [11].

The mental health crisis in Lebanon has also been exacerbated by the country's compounding economic and political instability. A study found that 58.7% of Lebanese healthcare workers experienced high distress during the COVID-19 pandemic, highlighting the urgent need for mental health interventions [12].

In Lebanon, the mental health crisis has worsened due to socio-economic and political instability. Farran [13] reported that the aftermath of the 2020 Beirut explosion caused significant psychological trauma among the youth, with 83% feeling sadness, 78% experiencing anxiety, and 11.5% having suicidal thoughts. The review emphasized the urgent need for prevention, early intervention, and systemic reforms to tackle these issues [13].

A study highlighted the importance of accessible psychoeducational interventions to improve mental health awareness and coping strategies among adolescents in Lebanon. These findings underscore the urgent need for targeted mental health support in communities with limited access to formal care [14].

Another study introduced the first life skills intervention aimed at enhancing well-being among university students in the Arab region. The findings demonstrated a positive impact on students' mental health, reinforcing the necessity of targeted interventions to support psychological resilience during academic transitions [15].

Rationale

Despite the global focus on student mental health, there is a notable lack of thorough research in Lebanon that addresses the specific challenges faced by first-year university students. This study seeks to fill this gap by exploring the psychosocial risks and mental health status of students making the transition from high school to university in Lebanon.

Objectives

The main goal of this study is to examine how common, severe, and frequent mental health among university students' issues between males and females like anxiety, depression, and stress are during this important transition period. By identifying key psychological stressors faced by students during this critical period, this research aims to contribute to the existing literature by offering insights into mental health patterns and informing targeted interventions to support student well-being.

Materials and methods

This cross-sectional study took place at several universities in Lebanon during the 2023-2024 academic year. Data was gathered through a self-reported recall survey. A convenience sampling method was used, with participants recruited via an online questionnaire shared

through university networks and social media. The English version of the questionnaire was used. The questionnaire gathered socio-demographic details such as gender and age. Additionally, information on parental and household characteristics was gathered, including parental employment status (employed, unemployed, self-employed, retired), parental education level, number of children in the family, household income, and housing status (own vs. rent).

Assessment of mental health

Participants' mental health was assessed using the General Health Questionnaire-28 (GHQ-28), a well-validated tool that evaluates mental health status [16]. The GHQ-28 is a widely used screening tool for psychological distress and has been validated in Lebanon, demonstrating good reliability and applicability in the Lebanese population [11, 12]. The GHQ-28 uses a four-point Likert scale (0–3), where lower scores reflect better mental health based on responses such as 'better than usual' (0), 'same as usual' (1), 'worse than usual' (2), and 'much worse than usual' (3). The total score is then calculated and ranged from 0 to 84, with a threshold of 24 or higher indicating possible mental health concerns.

Ethical considerations

The study received ethical approval from the Institutional Review Board (IRB) and Ethical Committee at the Holy Spirit University of Kaslik (approval number: HCR/EC 2024-041). The research followed the principles outlined in the Declaration of Helsinki [17]. Participants were thoroughly informed about the study's objectives and procedures prior to their involvement. Informed consent was obtained electronically, and participation was completely voluntary. We ensured that data confidentiality and anonymity were rigorously maintained to safeguard participants' privacy.

Data collection and analysis

The survey was distributed among university students throughout Lebanon to obtain a diverse sample of the student population. Since participants were recruited through voluntary participation, the sample may not fully represent all first-year students. This is a convenient sample. The data collected through the questionnaires were anonymized and securely stored. Statistical analyses were performed using IBM SPSS Statistics (version 22). Descriptive statistics were utilized to summarize demographic and behavioral characteristics. Statistical results were presented using frequencies, percentages, chi-square test results, and corresponding *p*-values.

Results

The analysis reveals key insights into university students' demographics, academic choices, and work status. The sample is evenly divided between males (46.3%) and females (53.7%), and all respondents were aged 17–23 years (Table 1).

As for work status, 60.7% of students did not work during their studies, with females (65.3%) being more likely to be non-working compared to males (55.5%). Among those who worked, 24.9% were employed part-time, and 2.8% worked full-time. A Chi-Square Test for Independence confirmed a statistically significant difference in work status between males and females ($\chi^2 = 18.81$, $p = 0.00086$), indicating that these differences are unlikely to be due to chance. Males were more likely than females to work day-shifts (8.4% vs. 4.4%), night shifts (6.7% vs. 4.0%), and full-time jobs (4.0% vs. 1.8%), further reinforcing the gender-based disparity in employment during studies (Table 2).

The analysis of parental and household characteristics shows that most students come from families with employed parents, with 71.7% of fathers and 61.4% of mothers employed. The majority of parents are alive, with a small percentage divorced or deceased. Most families have two or three children, and many parents have attained higher education, with 31.3% holding a bachelor's degree. In terms of income, the most common household earnings fall between $1000 and $1500 per month, and the majority of families own their homes. These findings suggest that students generally come from stable and moderately affluent households, with a significant portion benefiting from higher educational backgrounds (Table 3).

The analysis of health-related habits and medication use among university students shows that 69.3% of students do not smoke, with 30.7% reporting smoking. Most students engage in limited physical activity, with 36% exercising rarely and 25% not exercising at all. 57% of students report never consuming alcohol, while 27%

Table 1 Demographic and work-related characteristics of university students

Category	*Male*	*Female*	*Chi-square* χ^2	*P-value*
Gender	474 (46.3%)	550 (53.7%)		
Work Status				
Part-time:	120 (25.3%)	135 (24.5%)	18.81	0.00086 (<0.05)
Day Shift:	40 (8.4%)	24 (4.4%)		
Night Shift:	32 (6.7%)	22 (4%)		
Full-time:	19 (4%)	10 (1.8%)		
None:	263 (55.5%)	359 (65.3%)		

Table 2 Parental and household characteristics of university students

Category	*Total*
Father's Occupation	
Employed	734 (71.7%)
Unemployed	47 (4.6%)
Self-employed	179 (17.5%)
Retired	64 (6.3%)
Mother's Occupation	
Employed	629 (61.4%)
Unemployed	259 (25.3%)
Self-employed	105 (10.3%)
Retired	31 (3%)
Status of Father	
Alive	962 (93.9%)
Deceased	35 (3.4%)
Status of Mother	
Alive	960 (93.8%)
Deceased	37 (3.6%)
Divorced parents	27 (2.6%)
Number of Children in Family	
1	107 (10.4%)
2	396 (38.7%)
3	259 (25.3%)
4	188 (18.4%)
More than 4	74 (7.2%)
Highest Level of Parental Education	
Less than high school	34 (3.3%)
High school	154 (15%)
Diploma	150 (14.6%)
Some college/Technical training	252 (24.6%)
Bachelor's degree	320 (31.3%)
Graduate/professional degree	114 (11.1%)
Monthly Household Income	
Less than $500	56 (5.5%)
$500 - $1000	266 (26%)
$1000 - $1500	316 (30.9%)
$1500 - $2000	232 (22.7%)
$2000 - $2500	94 (9.2%)
More than $2500	60 (5.9%)
Housing Status of Family	
Renting	197 (19.2%)
Own	812 (79.3%)
Others	15 (1.5%)

Table 3 Health-related habits and medication use among university students

Category	*Total*
Do You Smoke?	
Yes	314 (30.7%)
No	710 (69.3%)
Frequency of Physical Exercise	
Never	256 (25%)
Once a month	369 (36%)
1–2 times per week	211 (20.6%)
3–5 times per week	126 (12.3%)
Daily	62 (6.1%)
Frequency of Alcohol Consumption	
Never	584 (57%)
Once a month	276 (27%)
1–2 times per week	129 (12.6%)
3–5 times per week	21 (2.1%)
Daily	14 (1.4%)
Do You Take Any Specific Medications?	
Chronic diseases	49 (4.8%)
Mental disorders	42 (4.1%)
Psychological disorders	29 (2.8%)
Headache	77 (7.5%)
Menstrual pain	164 (16%)
None	663 (64.7%)

drink rarely, and a small percentage consume alcohol regularly. In terms of medication use, 64.7% of students do not take any specific medications, but common reasons for medication use include menstrual pain (16%), headaches (7.5%), and chronic diseases (4.8%) (Table 4).

The GHQ-28 survey results highlight significant psychological distress among university students. The results indicated that the mean GHQ-28 score among participants was 27.88 (SD = 0.93), with observed scores ranging from 0 to 54.

It was used to assess mental health status across four key domains: Somatic Symptoms, Anxiety and Insomnia, Social Dysfunction, and Severe Depression.

In the Somatic Symptoms domain, 28.7% of students reported feeling worse than usual or much worse than usual in terms of overall health. Additionally, 26.5% experienced a sense of being run-down, while 27.7% complained of headaches, and 26.5% reported feelings of tightness or pressure.

For Anxiety and Insomnia, 31.7% of participants reported losing sleep over worry more than usual, while 26.6% experienced persistent strain. Additionally, 27.9% of students reported feeling overwhelmed, and 25.4% suffered from frequent panic or nervousness.

The Social Dysfunction domain revealed that 26.4% of students struggled to keep busy, 27.2% reported taking longer to complete tasks, and 35.9% experienced difficulties in decision-making. Moreover, 38.8% of students indicated a decline in their ability to enjoy daily activities.

Table 4 Mental health assessment using the GHQ-28 survey

Question	*Likert scale indicators*			
A) Somatic Symptoms				
1- Feeling well and in good health?	Better than usual (199, 19.4%)	Same as usual (531, 51.9%)	Worse than usual (214, 20.9%)	Much worse than usual (80, 7.8%)
2- Feeling in need of a tonic?	Not at all (492, 48.0%)	No more than usual (301, 29.4%)	Rather more than usual (164, 16.0%)	Much more than usual (67, 6.5%)
3- Feeling run-down and out of sorts?	Not at all (361, 35.3%)	No more than usual (377, 36.8%)	Rather more than usual (238, 23.2%)	Much more than usual (48, 4.7%)
4- Felt that you are ill?	Not at all (401, 39.2%)	No more than usual (375, 36.6%)	Rather more than usual (202, 19.7%)	Much more than usual (46, 4.5%)
5- Pains in your head?	Not at all (409, 39.9%)	No more than usual (331, 32.3%)	Rather more than usual (210, 20.5%)	Much more than usual (74, 7.2%)
6- Feeling of tightness or pressure?	Not at all (404, 39.5%)	No more than usual (348, 34.0%)	Rather more than usual (200, 19.5%)	Much more than usual (72, 7.0%)
7- Hot or cold spells?	Not at all (444, 43.4%)	No more than usual (328, 32.0%)	Rather more than usual (192, 18.8%)	Much more than usual (60, 5.9%)
B) Anxiety and Insomnia				
8- Lost sleep over worry?	Not at all (364, 35.5%)	No more than usual (336, 32.8%)	Rather more than usual (219, 21.4%)	Much more than usual (105, 10.3%)
9- Difficulty staying asleep once off?	Not at all (413, 40.3%)	No more than usual (345, 33.7%)	Rather more than usual (174, 17.0%)	Much more than usual (92, 9.0%)
10- Feeling constantly under strain?	Not at all (406, 39.6%)	No more than usual (341, 33.3%)	Rather more than usual (203, 19.8%)	Much more than usual (74, 7.2%)
11- Getting edgy and bad-tempered?	Not at all (411, 40.1%)	No more than usual (353, 34.5%)	Rather more than usual (191, 18.7%)	Much more than usual (69, 6.7%)
12- Getting scared or panicky for no reason?	Not at all (433, 42.3%)	No more than usual (331, 32.3%)	Rather more than usual (190, 18.6%)	Much more than usual (70, 6.8%)
13- Everything getting on top of you?	Not at all (401, 39.2%)	No more than usual (314, 30.7%)	Rather more than usual (216, 21.1%)	Much more than usual (93, 9.1%)
14- Feeling nervous and strung-up?	Not at all (453, 44.2%)	No more than usual (336, 32.8%)	Rather more than usual (149, 14.6%)	Much more than usual (86, 8.4%)
C) Social Dysfunction				
15- Managing to keep busy and occupied?	More so than usual (270, 26.4%)	Same as usual (497, 48.5%)	Rather less than usual (197, 19.2%)	Much less than usual (60, 5.9%)
16- Taking longer over tasks?	Quicker than usual (192, 18.8%)	Same as usual (464, 45.3%)	Longer than usual (279, 27.2%)	Much longer than usual (89, 8.7%)
17- Doing things well?	Better than usual (217, 21.2%)	About the same (487, 47.6%)	Less well than usual (246, 24.0%)	Much less well (74, 7.2%)
18- Satisfied with tasks?	More satisfied (224, 21.9%)	About the same (412, 40.2%)	Less satisfied (281, 27.4%)	Much less satisfied (107, 10.4%)
19- Playing a useful part?	More so than usual (205, 20.0%)	Same as usual (472, 46.1%)	Less useful (251, 24.5%)	Much less useful (96, 9.4%)
20- Capable of making decisions?	More so than usual (216, 21.1%)	Same as usual (440, 43.0%)	Less so (258, 25.2%)	Much less capable (110, 10.7%)
21- Enjoying day-to-day activities?	More so than usual (175, 17.1%)	Same as usual (452, 44.1%)	Less so (266, 26.0%)	Much less (131, 12.8%)
D) Severe Depression				
22- Thinking of self as worthless?	Not at all (458, 44.7%)	No more than usual (307, 30.0%)	Rather more (184, 18.0%)	Much more (75, 7.3%)
23- Life entirely hopeless?	Not at all (372, 36.3%)	No more than usual (312, 30.5%)	Rather more (258, 25.2%)	Much more (82, 8.0%)
24- Life isn't worth living?	Not at all (490, 47.9%)	No more than usual (287, 28.0%)	Rather more (151, 14.7%)	Much more (96, 9.4%)
25- Thought of ending life?	Definitely not (456, 44.5%)	I don't think so (344, 33.6%)	Has crossed mind (192, 18.8%)	Definitely have (32, 3.1%)
26- Nerves too bad to act?	Not at all (426, 41.6%)	No more than usual (317, 31.0%)	Rather more than usual (197, 19.2%)	Much more than usual (84, 8.2%)

Table 4 (continued)

Question	*Likert scale indicators*			
27- Wishing you were dead?	Not at all (490, 47.9%)	No more than usual (278, 27.1%)	Rather more than usual (172, 16.8%)	Much more than usual (84, 8.2%)
28- Idea of ending life keeps coming?	Definitely not (556, 54.3%)	I don't think so (294, 28.7%)	Has crossed mind (142, 13.9%)	Definitely has (32, 3.1%)

Table 5 Classification of psychiatric and non-psychiatric groups based on GHQ-28 scores

	Male	*Female*	*Total*	*Chi-square* χ^2	*P-value*
Non-Psychiatric	186, 39.2%	180, 32.7%	366, 35.7%	4.42	0.0035 (<0.05)
Psychiatric	288, 60.8%	370, 67.3%	658, 64.3%		

In terms of Severe Depression, 33.2% of students reported feelings of hopelessness, while 24.1% considered their life entirely hopeless. Alarmingly, 18.8% had thoughts of self-harm, and 3.1% seriously considered ending their life. Additionally, 25% of students felt worthless more than usual (Table 5).

Based on GHQ-28 scores, participants were categorized into 'Psychiatric' and 'Non-Psychiatric' groups. Participants scoring ≥24 are classified as 'Psychiatric,' while those scoring <24 are classified as 'Non-Psychiatric.' The total possible scores range from 0 to 84.

The results indicate that 64.3% of the total population falls under the 'Psychiatric' category, suggesting a high prevalence of mental health issues such as anxiety, stress, or depression, while 35.7% were classified as 'Non-Psychiatric,' indicating stable mental well-being.

Among males, 60.8% (288 participants) were classified as 'Psychiatric,' while 39.2% (186 participants) were in the 'Non-Psychiatric' group. For females, 67.3% (370 participants) were categorized as 'Psychiatric,' whereas 32.7% (180 participants) were in the 'Non-Psychiatric' group. These results suggest a slightly higher proportion of females experiencing psychological distress compared to males.

A Chi-Square Test for Independence was performed to assess whether gender and psychiatric classification are significantly associated. The results yielded a Chi-Square statistic (χ^2) of 4.42 (df = 1) and a p-value of 0.035 indicating a statistically significant relationship between gender and psychiatric classification.

Discussion

The shift from high school to university is a crucial time for students, filled with academic, social, and personal challenges that can greatly affect their mental health. This study found that 64.3% of participants showed signs of psychological distress based on their GHQ-28 scores, which aligns with global patterns indicating increased susceptibility to mental health issues during this transition [3, 5]. Auerbach et al. [18] noted that about one-third of first-year university students face a mental disorder, with anxiety and depression being the most prevalent worldwide [18].

A 2024 cross-sectional study in India by Sharma et al. revealed that 61.4% of university students reported depressive symptoms during their first year, with academic stress and familial expectations being significant contributors. These results closely resemble our findings, reinforcing the notion that the high prevalence of depressive symptoms is a global issue among university students [19].

A study from Nigeria explored the mental health of university students and found that 48.6% experienced moderate to severe anxiety, primarily due to academic pressure and social adjustment challenges. This is comparable to the 26.6% of Lebanese students reporting anxiety in our study, indicating shared stressors among student populations in developing nations [20].

The prevalence of severe depressive symptoms was concerning, with 33.2% of participants feeling hopeless and 3.1% contemplating self-harm. Similar studies have shown that depressive symptoms tend to spike during transitional phases due to a mix of academic, social, and financial pressures [21].

These results are in line with research from Egypt, where 68% of university students reported experiencing moderate to severe mental health issues, primarily due to academic pressures and life changes [8]. Likewise, a study focusing on first-generation college students in the United States found a 50% rise in depression rates during the COVID-19 pandemic [6].

A study in Lebanon found that better dietary habits, such as regular breakfast consumption, and lower psychological distress positively influenced academic performance among Lebanese university students [10]. Comparatively, our research emphasizes that 64.3% of students are psychiatric among first-year students.

Our study findings are comparable to the 58.7% distress observed among Lebanese healthcare workers in the study by Bizri et al. [12]. Both studies utilized the General

Health Questionnaire-28 (GHQ-28) to assess mental health, reinforcing the validity of our findings within the Lebanese context [12].

Our findings align with Bosqui et al. [14], who emphasized the role of psychoeducational interventions in addressing mental health challenges among adolescents in Lebanon. While their study focused on using a comic book to disseminate mental health knowledge, both studies highlight the prevalence of psychological distress and the necessity of culturally adapted mental health resources [14].

This situation may stem from cultural attitudes toward mental health and the availability of support systems. In contrast, Lebanese students encounter distinct stressors, such as ongoing socio-economic instability and the lingering effects of traumatic events like the 2020 Beirut explosion, which have increased psychological vulnerability [13].

The socio-economic challenges in Lebanon complicate the mental health landscape for students. The study revealed a concerning prevalence of feelings of hopelessness and worthlessness, with 33.2% of students reporting these symptoms. This is particularly alarming when compared to the global average, where such severe symptoms are reported by about 15–20% of university students [4]. This significant difference highlights the urgent need for mental health initiatives specifically designed for the Lebanese context.

Strengths and limitations

The limitation of this study is that it utilized a convenient cross-sectional study and that's why findings cannot be generalized. The strength of the study is that's the first one which has been done in Lebanon, in a large sample of university students, to study the mental health status in the transition period from high school to university.

Conclusion

This study highlights the high prevalence of mental health issues among university students in Lebanon during their transition from high school, with 64.3% of participants being psychiatric. These findings underscore the pressing need to address student mental health, particularly considering Lebanon's unique socio-economic and political challenges.

When compared to global data, the results reveal both shared and region-specific trends. Similarities with neighboring countries, such as Egypt, suggest common socio-cultural pressures, while differences from Western and Asian contexts reflect the distinct impact of Lebanon's socio-political instability on student well-being.

By providing a clearer picture of the mental health landscape among Lebanese university students, this research emphasizes the importance of proactive measures to support student well-being. Universities, policymakers, and healthcare providers should prioritize early intervention, improved access to mental health services, and the promotion of healthy coping strategies. Future research should focus on tracking long-term mental health trends and evaluating the effectiveness of interventions tailored to the Lebanese context.

Abbreviations

PTSD Post-Traumatic Stress Disorder
SPSS Statistical Package for the Social Sciences

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Informed consent

All participants provided written informed consent prior to their enrollment in the study, and participation was completely voluntary. We ensured that data confidentiality and anonymity were rigorously maintained to safeguard participants' privacy.

Authors' contributions

All authors (Khalil Darwich, Georges Jarrouge, Theresia Hannouch, Shafika Assaad) have equally contributed to this manuscript. The corresponding author is Rawad Affan, and this is the email: rawad.r.affan@net.usek.edu.lb. His phone number: +96171189912.

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Data availability

The datasets used during the current study are available from the corresponding author upon request.

Declarations

Ethics approval and consent to participate

This research is approved by The Research Ethics Committee (REC) of the Higher Center for Research (HCR) at Holy Spirit University of Kaslik – USEK (approval number: HCR/EC 2024-041).

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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