

Body Mass Index in Relation to Exposure of Bullying Attempts and Suicidal Ideation among Saudi Adolescents Female Students

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Abstract

Evidence indicates that obese or overweight female adolescents are more at risk of experiencing bullying and some degree of violence during their school life. The study aims to assess the relationship between female adolescents' BMI with the level of bullying and suicidal ideation and other socio-demographic factors. This descriptive cross-sectional study targeted 985 female students from eight National Guard (NG) middles and high schools. A self-administrative questionnaire (SRST and CABS) was used to collect demographic and anthropologic measurements. The result indicated a statistically significant positive relationship in terms of bullying and BMI with suicide risk among the adolescent students ($P = 0.000$), suicide risk in parents' education (mother-education $r = 0.112$, $P = 0.000$ and father-education $r = 0.097$, $P = 0.002$ respectively), and adolescents' BMI and age, father education, and family income $P = 0.000$, $P = 0.033$ and $P = 0.000$, respectively. In conclusion, the risk of bullying and suicide risk are higher among obese and overweight female adolescents.

Keywords: Adolescent; Body Mass Index; Bullying; Females; Suicidal Ideation

Introduction

High Body Mass Index (BMI), mainly obesity, is one of the global health issues that affects around 2 billion and 240 million individuals worldwide [1]. Based on the World Atlas (2018), the world country ranking of Saudi Arabia is the 14th in terms of the obesity prevalence rate, which was 35.4% [2]. Furthermore, the most updated Saudi Health Interview Survey (SHIS, 2013) showed that the prevalence rate was higher among Saudi females (33.5%) compared to Saudi males (24.1%).

Despite the severity of obesity-related physical health consequences, the obesity psychological and emotional related influences have risky negative impacts on adolescents, mainly on their social school-based roles. Obese or overweight female adolescents are more at risk of experiencing bullying and some degree of violence from their peers. Such risky behaviours lead them to be more stigmatized and isolated. Several international studies highlight the significant association between high BMI among adolescents and bullying. For instance, Koyanagi, *et al.* (2019) conducted a cross-sectional study to examine the association between obesity and bullying victimization among adolescents aged 12 to 15 years from 41 low and middle-low-income countries. Based on the study results, 35.1% of the total study population ($n = 114,240$) reported some bullying victimization. Out of the 35.1% of the bullying victimized adolescents, 11.1% overweight adolescents (girls, 11.4%; boys, 10.9%), and 3.9% (girls, 3.4%; boys, 4.4%) [3].

Vuuren, *et al.* (2019) conducted a self-report cohort study to examine the association between overweight and mental health problems among 13,740 secondary school students whose ages range between 13 - 14 years old. The study results indicate that overweight or obese adolescents were at higher risk of experiencing indirect (OR: 2.3; 95% CI 1.5, 3.7) or direct (OR: 1.4; 95% CI 1.2, 1.7) bullying victimization compared to their healthy-weight peers. Further, they are more susceptible to have some degree of suicidal thoughts after bullying victimization (indirect effect OR: 2.1; 95% CI 1.4, 3.2 and direct impact OR: 1.3; 95% CI 1.1, 1.5) while the associations between obesity and suicidal thoughts were stronger indirect effect (OR: 4.5; 95% CI 2.3, 9.1) and direct impact (OR: 1.5; 95% CI 1.1, 2.0) [4].

Garica-Hermoso, *et al.* (2019) conducted a cross-sectional study to address the association between bullying victimization and physical fitness among 7714 (boys, $n = 3,379$; girls, $n = 4,335$) healthy Colombian children and adolescents aged between 9 to 17 years old. The study's authors included cardiorespiratory fitness level to provide more in-depth insight regarding the association level. The result showed that there is a significant association between the traditional bullying victimization regardless of the existence of cardiorespiratory fitness but overweight or obese adolescents (boys, OR = 0.72 95% CI, 0.48 to 0.91, $p = .018$ vs. girls, OR = 0.87 95% CI, 0.65 to 0.94, $p = .030$ [5].

Accordingly, there is a need to have further studies to examine the impacts of high BMI among Saudi female adolescents, mainly in schools. It considers that the overweight and obesity prevalence rate is one of the morbidities and mortality leading factors within the Saudi population. Targeting Saudi female adolescents is the key indicator to address this problem early to minimize the quality deterioration among this vulnerable group of society. Indeed, addressing and examining this issue is compatible with Vision 2030, which discusses reducing obesity among the Saudi population, including adolescents. Therefore, the (MOH), in collaboration with the Ministry of Education, launched the "Rashaqa" program in 2017 to reduce obesity rates among school students targeting 1000 schools in 6 regions, which are Riyadh, Jeddah, Najran, Al-Jouf, Eastern Region, and Makkah [6].

Objective of the Study

The study's objectives were to assess the relationship between BMI and level of bullying and suicidal ideation. Also, to examine the relationship between selected socio-demographic variables, BMI, bullying, and suicidal ideation.

Materials and Methods

A quantitative descriptive cross-sectional design was used to conduct this study. The study's population includes Saudi adolescent females enrolled in one of the eight National Guard middles and high schools (Saudi governmental and non-profit schools). It is located in the Eastern part of Riyadh City. Using the sample size calculator with a confidence level of 95%, confidence interval of 3 and a population of 90000 students, the minimum number of necessary samples to meet the desired statistical constraints is 942. The study's samples increased to 985 students to ensure the representativeness of the sample. A convenience sample was recruited with the following inclusion criteria: Arabic Speakers, Saudi nationality, and enrolled as a full-time student. The exclusion criteria involve students who had any metabolic disorder or were diagnosed with psychiatric or mental conditions.

A self-administrative questionnaire was used, which covered part one, which includes the demographic data, where the authors developed a set of 5 questions to explore the subjects' demographic information. The demographic data consists of the participants' age, grade level, parent's educational levels, and family income. Part two involves anthropologic measurements, which included the participant's weight, height, and BMI. Part three covers the Suicidal Risk Screening Tool (SRST), a validated tool developed by NIMH 2008 as a youth screening tool (aged 10 to 21 years), mainly in the medical setting. It includes four yes/no questions and takes only 20 seconds to administer. "Yes," response to one or more of the four questions indicates that there is a risk for suicide. Part Four: Child Adolescent Bullying Scale (CABS): The CABS is a 20-item instrument designed to identify youths at risk for bullying exposure. CABS items reflect the components of the current definition of bullying. CABS was developed by the Centre for Disease Control and Prevention, the National Centre for Injury Prevention and Control. The item response categories include strongly agree, agree, neither agree nor disagree, disagree and strongly disagree, with each response option coded numerically from 1 - 5, where one corresponds to disagree strongly, and seven corresponds to agree strongly. CABS scale scores are computed by summing numeric scores for each item. The summed CABS scores can range from 20 to 100. A high score on the CABS represents a high level of bullying exposure. Analyses established internal consistency reliability (Cronbach's $\alpha = 0.97$), construct, and convergent validity. Sensitivity was 84%, specificity was 65% and the AUROC curve was 0.74 (95% CI: 0.69 - 0.80).

A pilot study was conducted to assess the need for further language-translation modification among a group of 25 students within the intended schools who were excluded from the study. The students gave their feedback and concerns to modify the selected tool. The IBM SPSS version 26 was used to analyse the study data, where the descriptive statistics presented the frequencies and percentages of the data, while the mean and standard deviation showed the interval and ratio variables. Person r tested the correlation between interval and ratio variables and test the correlation between ordinal and interval and ratio variables. The significance level was ($p < 0.05$).

Results and Findings

Participants demographic and BMI characteristics

More than two-thirds of the participants were in middle school and less than 15 years old (70.5% and 70.46%, respectively). More than one-third of the students' mothers and fathers completed university education (36% and 33.7%, respectively). A high percentage (80.1%) of the families had either acceptable or middle-level income (Table 1). Almost one-third (27.8%) of the participants were underweight as their BMI was lower than 18 kg/m². Out of all the students in the sample. 60.7% were within average weight as their BMI ranged between 18 to 25 kg/m². While only 11. 4% were either overweight or obese as their BMI was above 25kg/m² (See figure 1).

Variables	No.	%
Educational Level		
Middle School	694	70.5
High School	291	29.5
Age		
Less than 15 years	694	70.46
16 years and up	291	29.54
Mother's Education		
Illiterate	30	3.0
Elementary School	84	8.5
Middle School	148	15.0
High School	236	24.0
University	355	36.0
Graduate Studies	132	13.4
Father's Education		
Illiterate	5	.5
Elementary School	40	4.1
Middle School	67	6.8
High School	408	41.4
University	332	33.7
Graduate Studies	133	13.5
Family Income		
Week	5	.5
Acceptable	47	4.8
Middle	374	38.0
Upper-Middle	415	42.1
Excellent	144	14.6

Table 1: Frequency distribution of demographic characteristics of the students in the sample (N = 985).

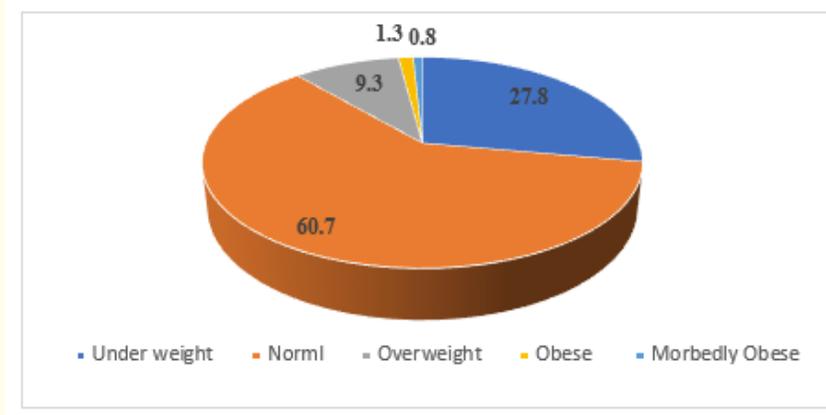


Figure 1: Frequency distribution of the body mass index of the students in the sample (n = 985).

Suicide risk screening

Among 985 students, 20.9% reported that they wished they were dead in the past few weeks. About 10% reported that they felt that they and their family would be better off if they were dead in the past few weeks. Only 7.9% reported that they have been having thoughts about killing themselves in the past week. Also, 10.3% indicated that they tried to kill themselves at least once before (Table 2).

Suicide Risk Screening	Yes		No	
	No.	%	No.	%
In the past few weeks, have you wished you were dead?	206	20.9	779	79.1
In the past few weeks, have you felt that you or your family would be better off if you were dead?	101	10.3	884	89.7
In the past week, have you been having thoughts about killing yourself?	78	7.9	907	92.1
Have you ever tried to kill yourself?	101	10.3	884	89.7

Table 2: Frequency distribution of suicide risk screening of the student in the sample (N = 985).

Bullying screening

Students reported high mean for the following variables: One or more kids at my school are mean to me (3.47 + 1.618), I am bothered when kids at school tease me (2.56 + 1.565), Kids at my school try to turn others against me (2.18 + 1.456) and Kids have been attempting to get me in trouble (2.16 + 1.475). While students reported low mean for the following variables: I have pretended to be sick, so I could stay home from school because I am being bullied (1.49 + 1.016), I have been threatened by another student in a mean or hurtful way (1.51 + 0.983, I wish I could go to another school because I am being bullied (1.53 + 1.011 and I) worry about bullying so much that I cannot pay attention to school (1.59 + 1.087) (See table 3). High percentages (77.3%) of the students reported that they were exposed to a low bullying level. Out of 985 students, 20.4% reported that they were exposed to a moderate level of bullying, while only 2.3% reported that they were exposed to a high level of bullying (See figure 2).

Variables	Mean	SD
Kids at my school make fun of me to make me feel bad	1.83	1.137
I get bullied at school	1.78	1.144
There are times that I do not want to go to school because I am being bullied	1.64	1.086
One or more kids at my school are mean to me	3.47	1.618
Kids at my school talk behind my back share my secrets or spread rumors about me	2.10	1.373
Kids at my school try to turn others against me	2.18	1.456
Kids leave me out or ignore me because I am different	1.67	1.108
Kids at my school joke or tease me in a way that bothers me	1.94	1.265
I wish I could go to another school because I am being bullied	1.53	1.011
Kids at my school ignore me on purpose	1.73	1.150
I have been threatened by another student in a mean or hurtful way	1.51	0.983
I worry about bullying so much that I cannot pay attention to school	1.59	1.087
Kids try to make me feel bad on purpose	1.76	1.232
I have pretended to be sick, so I could stay home from school because I am being bullied	1.49	1.016
I have been hurt by another student on purpose	1.91	1.276
Kids post or text mean or hurtful messages, comments, or photos about me on line	1.68	1.199
I have had upsetting memories of being bullied	1.82	1.308
I am bothered when kids at school tease me	2.56	1.565
Kids have tried to get me in trouble	2.16	1.475
I have had my stuff taken or damaged on purpose by another student	1.94	1.350

Table 3: Mean and standard deviation of child adolescent bullying scale (CABS) of the students in the sample (N = 985).

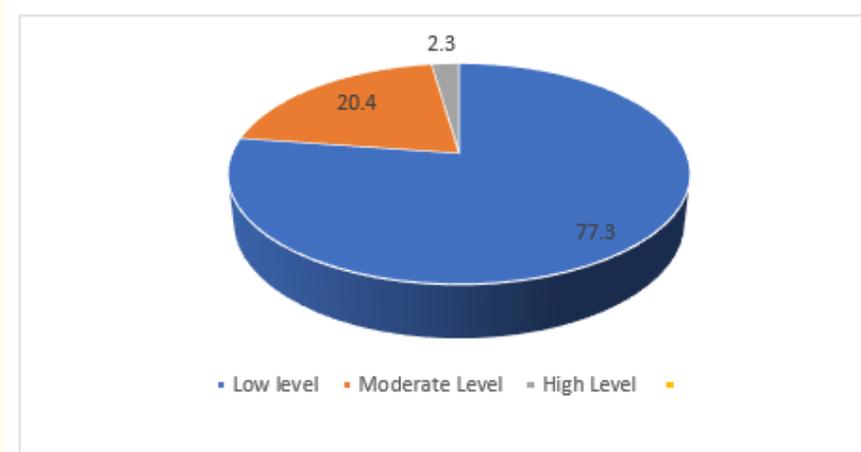


Figure 2: Percentage of level of bullying exposure among the students in the sample (n = 985).

Relationship between bullying and suicide risk

There was a statistically significant positive relationship between the total score of child adolescent bullying and suicide Risk among the sample students ($p = 0.000$). This indicated that the higher the child adolescent bullying score, there is an increase of suicide risk among the students (See figure 3).

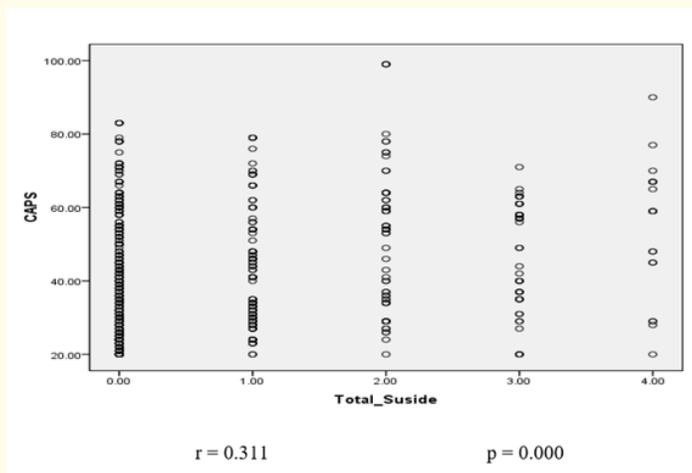


Figure 3: The relationship between total score of child adolescent bullying and suicide risk among the students in the sample ($n = 985$).

Relationship of adolescent BMI with bullying and suicide risk

There was no statistical relationship between body mass index and child adolescent bullying among the students in the sample ($p = 0.088$). There was a statistically significant positive relationship between body mass index and suicide risk Among the students in the sample ($p = 0.000$). This indicated that the higher the body mass index, the higher the score of child adolescent bullying the increased suicide Risk among the students (See figure 4).

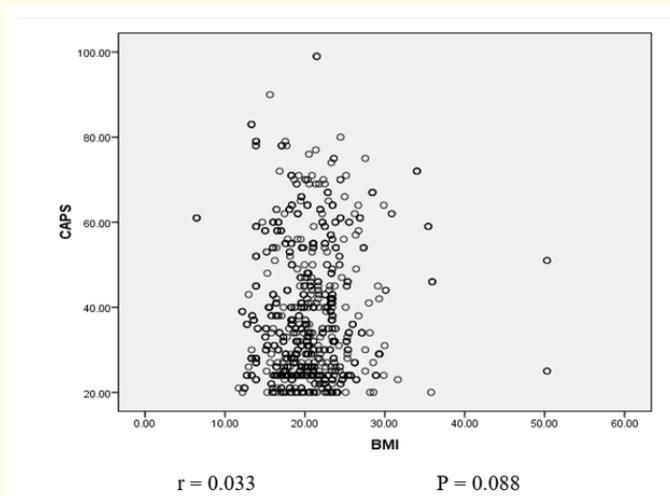


Figure 4: The relationship between body mass index and child adolescent bullying among the students in the sample ($N = 985$).

Relationship of Socio-demographic factors with BMI and suicide risk and bullying

There was a statistically significant positive relationship between age and body mass index ($p = 0.000$), as the age increase the body mass index increase. Also, there was a statistically significant positive relationship between age and Bullying ($p = 0.000$), as the age increase the bullying increase. There was a statistically significant negative relationship between students’ grade and Suicide risk ($p = 0.002$), as the risk of suicide increase with the lower grades. Also, there was a statistically significant positive relationship between students’ grade and bullying ($p = 0.007$), as the risk of pulling increase with higher grades. There was a statistically significant positive relationship between suicide risk and both mother and father education ($p = 0.000$ and $p = 0.002$). There was a statistically significant positive relationship between family income and body mass index ($p = 0.000$) (See figure 5).

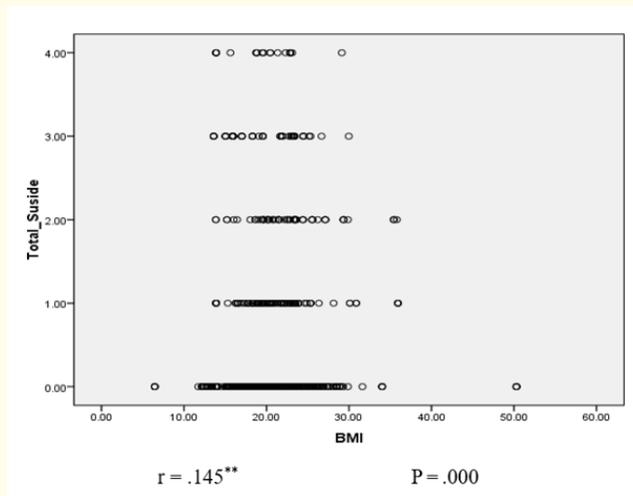


Figure 5: The relationship between body mass index and suicide risk screening among the students in the sample (N = 985).

Sociodemographic variables	Body Mass Index		Suicide Risk		Bullying	
	r	p	r	p	r	p
Student’s Age	0.145**	0.000	-0.055	0.085	0.111**	0.000
Students’ Grade	0.030	0.353	-0.097**	0.002	0.086**	0.007
Mother Education	-0.048	0.131	0.112**	0.000	0.075*	0.019
Father Education	0.068*	0.033	0.097**	0.002	0.046	0.149
Family Income	0.856**	0.000	-0.005	0.884	0.036	0.252

Table 4: Relationship between selected sociodemographic variables and Body Mass Index, Suicide Risk and Bullying among the Students in the Sample N = 985.

Discussion

The current study examines the association between the high BMI among Saudi female adolescents and youths, mainly in schools. According to the study results, adolescents who enrolled in middle schools and less than 15 years old represented the most extensive

study sample. 39.2% of the Saudi adolescent females have uncontrolled BMI, either underweight or overweight (27.8% and 11.4%, respectively). Several studies indicated that unhealthy BMI and perceived weight are significantly associated with suicidal ideations and behaviours [7-11]. The study results implied that, there was a statistically significant positive relationship between body mass index and suicide risk in female adolescents ($r = .145$, $p = 0.000$). Elia., *et al.* 2020 finds a similar result and indicated there was a positive association between overweight/obesity and suicidal ideation with planning for girls (OR 1.12, 95% CI 1.02 to 1.24, $p = 0.009$) after adjusting for age, psychosocial factors, health-related behaviours, and food insecurity [7].

Further, evidence suggests that adolescents with suicidal ideation will attempt suicide within a year and are considered risk factors for it [12-17]. This study results indicate that more than 20% of the study sample reported they wished to be dead within the past few weeks; almost 8% reported that they have thoughts about killing themselves, while 10% have suicidal attempts. Silva., *et al.* (2020) had a similar study and reported that 22.7% of female adolescents had suicidal ideation, while suicidal planning reached up 16.3% within 12 months [18]. Other studies in the United States and Southeast Asian countries indicated that female suicidal ideation ranged from 15.1% - 23.4% [18-21].

Several international studies revealed variation in the prevalence of bullying behaviours among adolescents mainly in schools. A Brazilian study showed that 40% the adolescent school students experience of being bullied, and in 50% the perpetration of maltreatment and/or bullying among students who enrolled in public and private high schools [22]. Similarly, this study indicates that almost all the study participants exposed to some degree of bullying during their school-life; however, the large portion of study sample (77.3%) exposed to low level of bullying while only, 2.3% of them reported that they exposed to high level of bullying. These results agree the high prevalence identified in a study conducted in Manitoba, Canada indicated that 58.3% (99% confidence interval [CI] = 57.0 - 59.0%) of boys and 67.8% (99% CI = 67.1 - 68.5%) of girls reported being bullied at least once in the past 12 months [15]. Further, the study implied there is no significant association between the bullying and uncontrolled BMI ($r = 0.033$, $p = 0.088$); however, there is a statistically significant association between the bullying and suicidal risks ($r = 0.311$, $P = 0.000$).

Other international studies support such a fact, for instance, De Oliveira Pimentel., *et al.* (2020) emphasized that bullying is a key risk factor for depression, psychiatric issues, and suicide among adolescents in schools [23]. Further, Cavalcanti., *et al.* (2018) [24] confirmed a positive association between victimization and depressive symptoms ($P < 0.01$); similar Alavi., *et al.* (2017), Barzilay., *et al.* (2017), and Sandoval-Ato., *et al.* (2018) reveal a significant positive relationship between victimization, social anxiety and depression ($P < 0.01$) [25-27].

The study results revealed a statistically significant positive relationship between age and body mass index ($r = 0.145$, $P = 0.000$); as age increases, the body mass index increases. Evidence has variations in terms of the relationships between increasing BMI and age variations among adolescents. For instance, Putri., *et al.* (2015) claimed no significant relationship between BMI and age ($r = -0.013$; $p = 0.458$) among Indonesian school female adolescents [28]. However, Al-Awadhi., *et al.* (2013) indicated that age at menarche was inversely and significantly associated with odds of overweight and obesity after adjusting for potential confounders, odds ratio 0.84 (0.77-0.93); ($p = 0.001$) among Kuwaiti adolescents [29]. Also, there was a statistically significant positive relationship between age and Bullying ($r = 0.111$, $P = 0.000$); as the age increase, the bullying increase among the study group. Several recent studies support the fact that younger adolescents may report greater victimization than older ones [12,16,18,23]. However, there is a tendency for this phenomenon to decrease as age increases in a justification of older students learn to defend themselves [23,30]. Further, the study indicated a statistically significant negative relationship between students' grades and suicide risk ($r = -0.097$, $P = 0.002$), which suggests that the risk of suicide increases with the lower grades.

The results imply a statistically significant positive relationship between suicide risk and both mother and father education ($r = 0.112$, $P = 0.000$ and $r = 0.097$, $P = 0.002$ respectively). There is an absence of scientific studies that focuses on the relationships between the parents' educational level and suicide risks among adolescent. However, several studies highlight the importance of including the sociodemographic factors of parents and families among adolescents at risk for suicide [31-34]. Thus, it requires highly educated parents to be more attentive to the risk factors that lead their youth to think about suicide [33,34].

Recommendations and Limitations

The study highlighted the importance of having a constructed plan from higher authorities within Saudi Arabia, such as the Ministry of Education that ensures the families, schools and community effective involvements to control and minimize the current situation regarding bullying and suicidal ideation. This study focused on bullying and suicide risks, which are severe matters within the Saudi population

in general and youth life quality. Indeed, in addition to BMI, they have significant and direct impacts psychologically, emotionally, and behaviourally. This study has several limitations; one of the most is the study sample focused on female adolescents, mainly in the capital city. Thus, impacts on the study's results generalizability; however, the study sample's socio-demographical variations minimize the lack of this study's generalizability.

Therefore, future studies need to expand the sample size and better gender distribution in the groups. Further, the study tools were self-reported measures that limit the accuracy level and the individual's expression for adolescents. Considering suicide is a taboo in Saudi Arabia and other countries, which has a deeply rooted social-constructed ideology. However, to overcome such a challenge, the study investigators mentored around 20 adolescent students selected randomly from the selected schools for the appropriate utilization of the study tools. Such a technique minimized the misinterpretation and enhanced the study sample's healthy and safe environment, allowing them to be more expressive. The study covers some socioeconomic factors that affect suicidal ideation; however, some other essential factors required further investigation, such as adolescents' social environments, school life, friendships, and social media use that influenced suicidal ideation.

Consequently, there is a need for further studies that explore individual and societal risk factors that lead to suicidal ideation and bullying among this vulnerable group of population. Additionally, it is highly recommended to include more scientific-based studies and various robust systematic reviews that explore the trends and national prevalence of suicidal ideation and bullying within the Saudi context.

Conclusion

This research is one of a kind within the Saudi context, where it investigated the correlation between BMI, bullying, and suicidal ideation among Saudi female adolescents. According to the study findings, there are exciting data but worrying facts regarding uncontrolled BMI, bullying, and suicidal ideation or attempts.

Ethics Approval and Consent to Participate

Ethical approval to conduct this study from college of nursing at King Saud bin Abdullah for Health Sciences, research unit was obtained by the researcher, and Ethical approval from the Institutional Review Board Committee (IRB) in King Abdullah International Medical Research Centre (KAIMRC) was also obtained. Participation in this study was completely anonymous and no identifying data was obtained. Data was entered in secured computer with strong password and only the research team will have access to this information.

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