BMJ Open

Utilisation of the health belief model to study the behavioural intentions relating to obesity management among university students: a cross-sectional study

Osama Albasheer ,[1] Nasser Hakami,[2] Siddig Ibrahim Abdelwahab,[3] Ahmad Y Alqassim,[1] Abdullah Alharbi,[1] Amani Osman Abdelmola,[1] Ahmed Abdallah Ahmed Altraifi,[4] Isameldin E Medani,[4] Ahlam Mohammed S Hakami,[4] Mnar H Moafa,[5] Rana I Abuhadi,[5] Alhassan H Hobani[5]

To cite: Albasheer O, Hakami N, Abdelwahab SI, *et al*. Utilisation of the health belief model to study the behavioural intentions relating to obesity management among university students: a cross-sectional study. *BMJ Open* 2024;**14**:e079783. doi:10.1136/bmjopen-2023-079783

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (https://doi.org/10.1136/bmjopen-2023-079783).

Received 19 September 2023
Accepted 01 April 2024

For numbered affiliations see end of article.

Correspondence to
Dr Osama Albasheer;
drosama802@gmail.com

ABSTRACT

Background Overweight and obesity are excessive fat accumulations linked with many health problems, including heart diseases, type 2 diabetes and cancer. Multiple studies have demonstrated that beliefs about overweight, obesity and self-efficacy play essential roles in the success of interventions for obesity management.

Objectives This study aimed to identify the perceptions of university students of overweight and obesity using the health belief model (HBM) and to analyse their association with the body mass index (BMI) categories of the students.

Design A cross-sectional questionnaire-based study and a multistage sampling technique were used to ensure the recruitment of students from selected colleges of Jazan University—Saudi Arabia.

Setting Six colleges of Jazan University were randomly selected to ensure equal representation of health sciences, sciences and humanities colleges.

Participants A total of 579 students completed an online survey between January and April 2023.

Primary and secondary outcome measures The primary outcome measures were demographic characteristics and HBM constructs. Secondary outcome measures were behavioural intentions relating to obesity management.

Results This study demonstrated that gender and self-reported family history of obesity were significantly correlated with the BMI categories of the students (p <0.001). Students in the underweight category showed the highest mean score for perceived severity (3.62 ±0.08). Perceived self-efficacy in exercise and diet was significantly associated with BMI categories, with adjusted ORs of 2.82 (2.10 to 3.79) and 1.51 (1.09 to 2.09), respectively. Perceived barriers to healthy eating and regular physical activity were significantly related to the behavioural intentions of obesity management. Multivariate logistic regression showed that perceived severity, perceived cues to action, perceived barriers and self-efficacy in dieting and exercise were significant predictors of behavioural intentions for the management of obesity.

Conclusion This study underscores the need for tailored health promotion strategies that consider the perceptions and beliefs of people about the management of obesity.

STRENGTH AND LIMITATIONS OF THIS STUDY

⇒ One of the strengths of this study was the use of a validated and reliable measurement tool, the health belief model (HBM).
⇒ This study clarifies the impact of all HBM components on obesity management practices among college students.
⇒ The study had a relatively large sample size, and by including students from both medical and non-medical colleges, we enhanced the generalisability of our findings to a broader student population.
⇒ Its cross-sectional design limits its ability to establish causal relationships.

INTRODUCTION

Body mass index (BMI) is a statistical measure of body fat based on height and weight in males and females of any age.[1] The National Institute of Health (NIH) and WHO categorise a person as underweight, normal weight, overweight or obese based on their BMI.[2] The global prevalence of overweight and obesity has reached epidemic proportions, affecting both developed and developing nations.[3–5] According to the WHO, approximately 1.9 billion adults aged ≥18 years were overweight in 2016, with at least 650 million classified as obese.[6] A critical period of risk for the development of obesity is the university phase of life, where changes in physical activity and eating patterns can lead to significant weight gain.[7 8] In particular, Saudi Arabia is

witnessing an alarming increase in overweight and obesity among young adults, posing a significant threat to public health.[9 10] Maintaining healthy weight has become a vital health priority for university students because of these lifestyle changes. Several preventive and treatment strategies have been applied for weight control.[11] However, adherence to treatment strategies varies among individuals for various reasons.[11 12] Therefore, there is an urgent need to develop effective weight management strategies explicitly tailored to university students. To create effective weight management strategies for university students, it is essential to understand the factors that influence appropriate weight loss behaviour. Previous studies have demonstrated that psychosocial variables such as self-efficacy and beliefs about health and obesity play essential roles in the success of weight treatment strategies.[13–15] The health belief model (HBM) is a psychosocial model that can be used to guide health promotion and disease prevention interventions.[16 17] The six constructs of the HBM address an individual's specific perceptions of susceptibility, benefits, barriers, cues and self-efficacy, which predict individual health-related behaviours.

HBM has been used in many previous studies as an important predictor of definite intention to take influenza and COVID-19 vaccines.[18 19] The relationship between perceptions of obesity and their impact on obesity management remains relatively unexplained in the existing literature in Saudi Arabia. University students in Saudi Arabia exhibited a high perception of the severity of obesity and the benefits of physical activity towards obesity prevention in a previous study. However, only 50% of them believe they have a higher risk of obesity.[20] The researchers used only four constructs of the HBM: perceived seriousness of obesity, perceived susceptibility to obesity, the perceived benefit of physical activity in preventing obesity and perceived barriers to physical activity in preventing obesity. The perceived benefits of a healthy diet and cues to action towards adopting a healthy diet were not assessed. Therefore, this study aimed to explore the significant HBM constructs that determine university students' perceptions of obesity, to analyse their association with the BMI categories of the students and to determine their association with the success of behavioural interventions for obesity management. This study provides critical information to develop effective obesity management interventions for university students.

METHOD

Study setting

This cross-sectional study was conducted with university students recruited from Jazan University between January and April 2023. Jazan University is one of the largest institutions of higher education in Saudi Arabia. The main central campus of Jazan University is located on the southwest coast of Saudi Arabia close to the Red Sea. Additional campuses were present in Abu Arish, Sabya, Samtah, Farasan, Ad-darb, Al-Daer and Al-Ardah. The university has 23 colleges.

Sample size and sampling technique

The StatCalc function of the Epi Info formula was used to estimate the sample size required for this study. A sample size of 526 was the minimum estimated sample size based on the following assumptions: population size of 60 000 students, 5% acceptable margin of error, 95% CI and expected prevalence of 50% of students with a high risk of obesity (as there are no available studies to estimate the prevalence among university students). With the addition of a 10% non-response rate, the final sample size was 579 participants. A multistage sampling technique was used to ensure participant recruitment. In the first stage of sampling, we divided the colleges into three strata (health sciences, sciences and humanities colleges). We then randomly selected six colleges to ensure the equal representation of health sciences, sciences and humanities colleges. Two colleges were selected for each group. Second, we ensured that the identified sample of participants represented different stages of students' university routes. In the final sampling unit, we distributed the questionnaire to the selected classes while ensuring an equal representation of male and female students; see online supplemental appendix 1.

Participant selection and data collection

Data were collected using a self-administered questionnaire to measure the demographics and HBM components; see online supplemental appendix 2. The collected demographic details were related to the participants' age, gender, college, year of study and social status. Students registered at Jazan University at the time of recruitment were included in this study. Those who were not Jazan University students were excluded from this study. Well-trained and qualified students distributed and handled the questionnaires. Informed written consent was obtained from all participants before the start of the study, and the questionnaires were completed while the students were present in their classes.

Measurement tool

The first part of the questionnaire focused on the baseline characteristics of the participants, such as age, gender, college, class, marital status, height (cm) and weight (kg), whether any members of the student's family were obese, experience with diet therapy, experience with weight loss behaviour, experience with exercise therapy and experience with medical treatment. The second part of the questionnaire was for the key constructs of the HBM, including 89 statements.[16 17] Each statement was rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). Thirteen questions evaluated perceived severity on three subscales (emotional/mental, health, physical health/fitness and social professional). Seven questions evaluated perceived susceptibility and consisted of two subscales (lifestyle and environmental). Fourteen

questions dealt with perceived barriers, comprising three subscales (practical concerns, emotional/mental health and awareness). Thirteen questions on perceived benefits included three subscales (emotional/mental health, physical health/fitness and social/professional). The 12 questions on cues to action consisted of two subscales (internal and external cues to action). Eighteen questions assessed self-efficacy in dieting and included two subscales (habits, preferences and emotional/mental health). The seven questions on self-efficacy in exercise and five questions on the behavioural intention of weight management consisted of two subscales (dieting and exercising). All statements were rated on a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Reliability and validity

A subgroup of 30 randomly selected students was asked to repeat the survey after a 2-week interval to assess the test–retest reliability of the questionnaire. The necessary changes were made: some questions were rephrased, others were cancelled, and the tools were reconstructed and ready for use. The intraclass correlation coefficient (ICC) was computed to evaluate the stability over time. The ICC indicated excellent agreement (ICC=0.86). The piloted samples were excluded from the study. Reliability was calculated using internal consistency (Cronbach's alpha). Alpha coefficients equal to or higher than 0.70 were considered satisfactory.[21] The overall reliability of the instrument based on Cronbach's alpha was 0.92.

Statistical analysis

Data were revised, coded and analysed using the Statistical Package for Social Sciences, V.26. The characteristics and beliefs of the participants were described using means (±SD) and frequencies (percentages), wherever appropriate. Weight groups were divided into three categories: underweight (BMI <18.5 kg/m^2), normal weight (18.5 ≤BMI <25 kg/m^2), overweight (BMI 25–29.9 kg/m^2) and obese (BMI ≥30 kg/m^2) according to the NIH and the WHO classification for white, Hispanic, and black individuals.[2] Cross-tabulation of BMI categories was performed using the paired t-test and the χ^2 test. Based on the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests, the BMI variable did not follow a normal distribution. This information is relevant for understanding the distributional properties of BMI data and may have implications for subsequent statistical analyses or modelling approaches. Therefore, we opted to use the χ^2 test because the BMI variable did not follow a normal distribution. Multivariate logistic regression analysis was performed. Gender, age, college year, marital status, income, perceived severity, cue to action, perceived susceptibility, perceived barriers, perceived benefits, perceived self-efficacy in exercise and perceived self-efficacy in diet were used to explain the variability in the behavioural intention of weight management (dependent variable). Each variable was included individually to obtain the crude OR using logistic regression models. Statistical significance was set at p <0.05.

Patient and public involvement statement

Students were involved in the pilot study to enhance the reliability of the questionnaire, and actively participated in the training session before data collection. The results of this study will be disseminated to students as a reflection of their perception of overweight and obesity status and will be involved in the implementation of future obesity management interventions.

RESULTS

Demographic and baseline information

A total of 579 undergraduate students participated in this study and completed the entire online survey. Based on self-reported weight and height data, the mean BMI was 24.21 (±6.52; range, 12.70–65.67) kg/m^2. The baseline characteristics of the respondents based on the BMI categories are presented in table 1. The percentages of individuals who were underweight, normal-weight, overweight and obese were 16.4%, 47.9%, 19.9% and 15.9%, respectively. More than half the participants were from health colleges. Most of the students (85.5%) were single. They belonged to the age group of 21–23 years (58.7%). A highly significant relationship (p <0.001) was found between the participants' BMI category and the gender. Compared with the percentage of female students in the same categories, the percentage of male students who were overweight or obese was much higher. There was a significant relationship between a self-reported family history of obesity and BMI category (p <0.001). Age, marital status, income and undergraduate institution did not show significant associations (p >0.05) with BMI categories. Half of the participants (59.2%) reported being engaged in physical activities. Diet therapy is a term used to describe the adoption of a diet to simply promote optimum weight. In this study, there was a statistically significant difference (p <0.001) between the participants' experiences with diet therapy and their weight categories. Similar results were observed between BMI categories and experience with weight loss behaviour and exercise therapy (p <0.001), as shown in table 1. Most of the students, regardless of their BMI categories, agreed that their motivation to maintain healthy weight was to improve their health and appearance.

HBM constructs and intention scale among BMI categories

Reliability (internal consistency) was calculated using Cronbach's alpha. Table 2 shows the alpha coefficients for all HBM constructs and intention scales. All scales had values higher than 0.67. Based on Cronbach's alpha, the overall reliability of the HBM is 0.97. The mean scores of the total perceived severity scale of the whole group were 3.38 ±0.03 for all respondents, which showed significant differences among the three groups (p <0.001). Students in the underweight category showed the highest mean

Table 1 The association between the BMI categories and the demographic and baseline characteristics of the participants

Variable	All (n=579)	Underweight (n=95)	Normal (n=277)	Overweight (n=115)	Obese (n=92)	P value
Gender						
Male	280 (48.4)	35 (6)	121 (20.9)	70 (12.1)	54 (9.3)	<0.001
Female	299 (51.6)	60 (10.4)	156 (26.9)	45 (7.8)	38 (6.6)	
Age						
18–20	150 (25.9)	35(6)	68 (11.7)	28 (4.8)	19 (3.33)	>0.05
21–23	340 (58.7)	49 (8.5)	159 (27.5)	71 (12.3)	61 (10.5)	
24 and above	89 (15.4)	11 (1.9)	50 (8.6)	16 (2.8)	12 (2.1)	
College						
Non-medical	241 (41.6)	45 (7.8)	125 (21.6)	42 (7.3)	29 (5.0)	>0.05
Medical	338 (58.4)	50 (8.6)	152 (26.3)	73 (12.6)	63 (10.9)	
Academic year						
First	56 (9.7)	17 (2.9)	27 (4.7)	7 (1.2)	5 (0.9)	<0.05
Second	79 (13.6)	14 (2.4)	40 (6.9)	14 (2.4)	11 (1.9)	
Third	131 (22.6)	20 (3.5)	49 (8.5)	33 (5.7)	29(5)	
Fourth	115 (19.9)	14 (2.4)	55 (9.5)	24 (4.1)	22 (3.8)	
Fifth	105 (18.1)	21 (3.6)	53 (9.2)	19 (3.3)	12 (2.1)	
Sixth	93 (16.1)	9 (1.6)	53 (9.2)18	(3.1)	13 (2.2)	
Marital status						
Single	495 (85.5)	87 (15.0)	228 (39.4)	97 (16.8)	83 (14.3)	>0.05
Married	75(13)	6 (1.0)	45 (7.8)	16 (2.8)	8 (1.4)	
Divorce	9 (1.4)	2 (0.3)	4 (0.5)	2 (0.3)	1 (0.2)	
Income						
Low	198 (34.2)	35 (6.0)	89 (15.4)	39 (6.7)	35 (6.0)	>0.05
Moderate	143 (24.7)	24 (4.1)	72 (12.4)	23 (4.0)	24 (4.1)	
High	238 (41.1)	36 (6.2)	116 (20.0)	53 (9.2)	33 (5.7)	
Family history of obesity						
Yes	196 (33.9)	15 (2.6)	65 (11.2)	44 (7.6)	72 (12.4)	<0.001
No	383 (66.1)	80 (13.8)	212 (36.6)	71 (12.3)	20 (3.5)	
Experience in weight loss behaviour						
Yes	171 (29.5)	7 (1.2)	75 (13.0)	49 (8.5)	40 (6.9)	<0.001
No	408 (70.5)	88 (15.2)	202 (34.9)	66 (11.4)	52 (9.0)	
Experience of diet therapy						
Yes	230 (39.7)	7 (1.2)	91 (15.7)	72 (12.4)	60 (10.4)	<0.001
No	349 (60.3)	88 (15.2)	186 (32.1)	43 (7.4)	32 (5.5)	
Experience of exercise therapy						
Yes	343 (59.2)	30 (5.2)	151 (26.1)	92 (15.9)	70 (12.1)	<0.001
No	236 (40.8)	65 (11.2)	126 (21.8)	23 (4.0)	22 (3.8)	
Experience of medical treatment						
Yes	56 (9.7)	5 (0.9)	22 (3.8)	9 (1.6)	20 (3.5)	<0.001
No	523 (90.3)	90 (15.5)	255(44)	106 (18.3)	72 (12.4)	
Reason of weight management behaviour						
Health and better appearance	406 (70.1)	58 (10.0)	197 (34.0)	84 (14.5)	67 (11.6)	<0.001
Better appearance	58 (10.0)	5 (0.9)	26 (4.5)	20 (3.5)	7 (1.2)	
Health	81 (14.0)	17 (2.9)	37 (6.4)	11 (1.9)	16 (2.8)	
Others	34 (5.9)	15 (2.6)	17 (2.9)	0 (0.0)	2 (0.3)	

Categorical data are expressed as frequencies and percentages. Statistical significance was determined using the χ^2 test for association. Based on the results of the Kolmogorov-Smirnov and Shapiro-Wilk tests, the BMI variable did not follow a normal distribution. This information is relevant for understanding the distributional properties of BMI data and may have implications for subsequent statistical analyses or modelling approaches. Therefore, we opted to use the χ^2 test because the BMI variable did not follow a normal distribution.
BMI, body mass index.

Table 2 HBM constructs and intention scale among BMI categories

Variable	All	Underweight	Normal	Overweight	Obese	P value
Perceived severity						
Emotional/mental health subscale	3.55±0.04	3.75±0.10	3.64±0.06	3.37±0.06	3.33±0.06	0.003
Physical health/fitness subscale	3.38±0.04	3.60±0.10	3.45±0.06	3.21±0.09	3.18±0.10	0.004
Social/professional subscale	3.21±0.04	3.52±0.10	3.25±0.06	3.02±0.09	3.01±0.10	0.001
Total	3.38±0.03	3.62±0.08	3.45±0.05	3.20±0.08	3.18±0.08	0.000
Perceived susceptibility						
Lifestyle subscale	3.43±0.05	3.62±0.11	3.530.06	3.410.11	2.980.11	0.000
Environmental subscale	3.58±0.05	3.61±0.13	3.69±0.07	3.41±0.12	3.43±0.13	0.111
Total	3.47±0.04	3.61±0.10	3.58±0.06	3.41±0.10	3.11±0.10	0.001
Perceived barriers						
Practical concerns subscale	3.53±0.09	3.53±0.09	3.61±0.06	3.40±0.10	3.42±0.10	0.000
Emotional/mental health subscale	3.39±01.0	3.63±0.10	3.44±0.06	3.25±0.09	3.20±0.10	0.000
Awareness subscale	3.38±0.05	3.56±0.12	3.39±0.06	3.29±0.10	3.30±0.11	0.000
Total	3.42±0.04	3.58±0.09	3.46±0.05	3.31±0.08	3.30±0.09	0.000
Perceived benefits						
Emotional/mental health subscale	3.43±0.05	3.63±0.12	3.45±0.07	3.34±0.11	3.27±0.12	0.159
Physical health/fitness subscale	3.35±0.05	3.54±0.13	3.41±0.07	3.24±0.11	3.11±0.12	0.060
Social/professional subscale	3.42±0.05	3.61±0.13	3.49±0.07	3.24±0.12	3.21±0.12	0.047
Total	3.39±0.05	3.58±0.12	3.43±0.07	3.27±0.11	3.18±0.12	0.051
Cue to action						
Internal cues	3.50±0.04	3.63±0.10	3.54±0.06	3.41±0.09	3.37±0.11	0.218
External cues	3.47±0.04	3.61±0.11	3.54±0.06	3.32±0.10	3.26±0.11	0.035
Total	3.50±0.04	3.63±0.10	3.56±0.06	3.38±0.09	3.33±0.10	0.069
Perceived self-efficacy in dieting						
Habits and preferences subscale	3.48±0.04	3.56±0.09	3.53±0.05	3.36±0.08	3.41±0.09	0.217
Emotional/mental health subscale	3.42±0.04	3.55±0.11	3.45±0.06	3.31±0.09	3.32±0.11	0.279
Total	3.47±0.04	3.56±0.09	3.51±0.05	3.34±0.08	3.39±0.09	0.194
Perceived self-efficacy in exercise						
Total	3.38±0.04	3.52±0.11	3.38±0.06	3.33±0.10	3.33±0.09	0.395
Behavioural intention of weight management						
Diet therapy subscale	3.35±0.05	3.34±0.13	3.41±0.06	3.31±0.10	3.27±0.12	0.714
Exercise therapy subscale	3.44±0.05	3.35±0.14	3.49±0.07	3.48±0.12	3.33±0.14	0.639
Total	3.38±0.05	3.34±0.13	3.43±0.06	3.37±0.10	3.29±0.12	0.702

BMI, body mass index; HBM, health belief model.

score for perceived severity (3.62 ±0.08). The emotional and mental health subscale beliefs received higher ratings than the other severity subscales (3.55 ±0.04). Underweight and normal-weight students rated the emotional/mental health subscale higher than the overweight group (p <0.01). Moreover, the mean physical health/fitness scores and social/professional subscales showed significant differences among the three groups (p <0.05). Regarding the perceived susceptibility to obesity risk, the total number of respondents yielded a mean score of 3.47 ±0.04. The students who were considered underweight had the highest average score (3.61 ±0.10); nevertheless, there were substantial disparities between each of the four categories. The four categories of the environmental subscale for perceived susceptibility showed no significant difference (p =0.111). The mean score for the perceived barriers scale was 3.42 ±0.04, with statistically significant variations between the BMI categories. The underweight category showed the highest levels of perceived barrier (3.58 ±0.09), followed by the normal weight category (3.46 ±0.05) and the underweight category (3.31 ±0.08). The mean score for the perceived benefits of adopting healthy food and exercise habits was 3.39 ±0.05. Significant differences were found between the four subgroups on the social/professional subscale (3.61 ±0.13). The mean score for perceived cues to action for obesity management was 3.50 ±0.04. The normal-weight category achieved the highest score (3.63 ±0.10), but there were no notable differences between the four groups. The study groups did not differ in their mean ratings of

Table 3 Multivariate logistic regression analysis of variables that influence behavioural intentions of obesity management

Variable	Crude OR	95% CI	Adjusted OR#	95% CI
Gender male (REF)				
Female	1.57	1.22 to 2.18	1.14	0.93 to 1.95
Age 18–20 (REF)				
21–23	0.96	0.65 to 1.40	0.64	0.33 to 1.26
24 and above	1.62	0.95 to 2.76	1.15	0.47 to 2.77
College non-medical (REF)				
Medical	1.07	0.77 to 1.49	1.06	0.69 to 1.64
Academic year first (REF)				
Second	1.47	0.74 to 2.94	1.64	0.68 to 3.95
Third	1.16	0.61 to 2.18	1.27	0.52 to 3.12
Fourth	1.16	0.61 to 2.22	1.34	0.50 to 3.56
Fifth	1.49	0.77 to 2.22	2.00	0.73 to 5.44
Sixth	1.71	0.87 to 3.35	1.56	0.57 to 4.32
Marital status single (REF)				
Married	1.56	0.97 to 2.50	1.39	0.71 to 2.75
Income low (REF)				
Moderate	1.08	0.70 to 1.67	0.72	0.41 to 1.28
High	1.27	0.87 to 1.86	0.91	0.56 to 1.47
Perceived severity	2.51	1.98 to 3.17	1.01	0.72 to 1.43
Cue to action	2.61	2.13 to 3.19	1.34	0.99 to 1.79
Perceived susceptibility	2.03	1.69 to 2.43	1.00	0.75 to 1.32
Perceived barriers	3.07	2.41 to 3.92	1.39	0.99 to 1.95
Perceived benefits	2.07	1.76 to 2.44	1.03	0.79 to 1.34
Perceived self-efficacy in exercise	4.23	3.13 to 5.39	2.82	2.10 to 3.79
Perceived self-efficacy in diet	3.45	2.70 to 4.41	1.51	1.09 to 2.09

internal cues to action. The student groups' mean ratings of external cues to action differed significantly ($p < 0.05$). The mean rating of self-efficacy in dieting was 3.47 ±0.04, which showed no significant differences among the four groups ($p = 0.194$), as students in the underweight category showed the strongest belief about their self-efficacy in dieting (3.55 ±0.11), followed by students in the normal-weight (3.45 ±0.06), obese (3.32 ±0.11) and overweight categories (3.31 ±0.09). Habits/preferences and emotional/mental health subscales showed no significant differences among BMI categories. Moreover, perceived self-efficacy on the exercise scale showed no significant differences. The overall mean score for behavioural intention of obesity management was 3.38 ±0.05. According to the findings, students planned to manage their weight by dieting rather than engaging in physical activity. The four groups did not differ significantly from one another in terms of the overall mean score of the behavioural intention of the obesity management scale, nor did they differ in terms of either of the two subscales.

Multivariate logistic regression

Table 3 shows the variability in the behavioural intentions of the management of obesity. Gender, age, college year, marital status, income, perceived severity, cue to action, perceived susceptibility, perceived barriers, perceived benefits, perceived self-efficacy in exercise and perceived self-efficacy in diet were used to explain the variability in the behavioural intentions of obesity management (dependent variable). Each variable was included individually to obtain the crude OR using logistic regression models. Except for age, college, year, marital status and income, all variables showed significant associations with behavioural intention of obesity management. However, in multivariate logistic regression analysis, some variables showed a significant association. Perceived self-efficacy in exercise and diet was significantly associated with BMI categories, with adjusted ORs of 2.82 (2.10 to 3.79) and 1.51 (1.09 to 2.09), respectively. The data used met the assumptions of the logistic regression. The Hosmer-Lemeshow test showed a good fit of the data to the logistic regression ($\chi^2 = 9.98$, $p = 0.267$).

DISCUSSION

Body weight loss and, in particular, maintaining an ideal body weight, are challenging because of the difficulty of

permanently altering lifestyle choices instead of temporarily. It is essential to predict and manage obesity in its early stages to prevent the development of chronic diseases. Increasing physical activity and maintaining a balanced diet are two popular behavioural approaches to overcome obesity.[22] The primary goal of this study was to apply the HBM as a framework to determine the predictors of behavioural intentions around obesity management among students at Jazan University. Successful adoption of lifestyle choices for the sake of obesity management requires comprehensive strategies, individual actions and integration between stakeholders at local, national and international levels. Perceptions of responsibility are likely to play a role at various levels, including society, governmental policies, healthcare planning and social work, prevention organisations and food and marketing industries.

Our study revealed a significant association between gender and self-reported of existence of at least one obese family member and the BMI categories of students. These findings are consistent with previous research, underscoring the complex interplay between genetic and environmental factors in obesity.[20 23 24] However, the complexity of the relationships and confounders of other socioeconomic indicators could account for this heterogeneity. Extensive quantitative studies and adjusted models are required to reflect the specific attributes of socioeconomic status.

Nearly one-third of the students in this study reported attempting to lose weight. This experience differed significantly between the BMI categories. Almost half of the students reported having previously attempted to control their diet and exercise to lose weight, while a few reported having tried medical therapy. This result is consistent with other studies that examined weight loss strategies among youth and university students.[23 25–27] This consistency across different populations underscores the global nature of the obesity challenge and the widespread need for effective, evidence-based obesity management strategies.

The motivating factor for weight control among the students in this study was a combination of health and appearance. This finding diverges from previous studies that found health or appearance to be the primary motivator.[23 26 28] This discrepancy may reflect cultural differences or shifts in societal attitudes towards health and body image. Health promotion strategies should consider the diverse motivations for weight control and aim to foster healthy attitudes towards body image.

Perceptions about the severity of obesity varied among participants, with students in underweight and normal-weight categories rating the emotional/mental health subscale higher than students in overweight category did. This is consistent with prior research indicating that individuals with obesity often have a lower perceived severity of their weight status.[23] However, this contrasts with other studies, in which most patients with obesity seeking help recognised obesity as a disease and were aware of the risks associated with obesity.[29–31] This discrepancy emphasises the need for education and awareness campaigns to enhance understanding of the health risks associated with obesity.

In terms of self-efficacy, our study found that underweight students had the strongest beliefs in their self-efficacy regarding dieting and exercise, followed by students who are normal, obese and overweight. However, no significant differences were observed between the BMI categories. This aligns with previous research that found that self-efficacy plays a crucial role in adopting new health activities.[23 32 33] This suggests that interventions to improve obesity management should consider strategies to boost self-efficacy, particularly among students who are overweight and obese.

Perceived barriers to healthy eating and regular physical activity significantly influenced the behavioural intentions of obesity management. This is consistent with previous research, indicating that practical concerns often hinder adherence to healthy behaviours.[34 35] These findings highlight the need for interventions that address practical barriers to healthy eating and physical activity, such as time constraints, lack of access to healthy foods or exercise facilities, and lack of knowledge about healthy behaviours.

Finally, our multivariate logistic regression analysis revealed that perceived severity, cues to action, barriers and self-efficacy in dieting and exercise were significant predictors of behavioural intentions for obesity management. Self-efficacy in dieting and exercise emerged as the most significant predictor among the independent variables. This finding underscores the importance of self-efficacy in adopting and maintaining healthy behaviours, aligning with the theoretical underpinnings of the HBM and previous empirical research.[23 36]

There was no substantial difference across the BMI categories regarding the perceived benefits of adopting healthy dietary and exercise habits. Emotional and mental health benefits were rated higher than other subscale constructs. This finding aligns with a previous study that found stronger beliefs about these benefits in underweight and normal-weight categories.[23] This emphasises the positive psychological and physical health outcomes of nutrient-rich diets and regular physical activity. Perceived cues to action were linked to obesity management in our study. Normal-weight students reported high ratings for these cues, although the differences across BMI categories were not statistically significant. However, external cues were rated significantly higher than internal cues, a departure from a previous study that found that both cues mediate the relationship between cues to action and obesity management intentions.[23] This discrepancy suggests the need to further explore how internal and external cues, which relate to self-esteem and the facilitation of task-specific rules, respectively, contribute to achieving personal and professional goals. Multivariate logistic regression identified perceived severity, cues to action, barriers and self-efficacy in dieting and exercise

as significant predictors of obesity management intentions. Among these, self-efficacy in dieting and exercise emerged as the most influential factor.

CONCLUSIONS

This study applied the HBM to understand behavioural intentions around obesity management in Jazan University students. The results highlight the complex interplay between gender, self-reported family history and self-efficacy in diet and exercise. Health promotion strategies should focus on enhancing the awareness of obesity risks, addressing perceived barriers and boosting self-efficacy. Discrepancies with previous research suggest cultural and societal influences on health and body image attitudes, indicating the need for tailored intervention strategies. Future research should consider longitudinal studies and explore additional factors influencing obesity management behaviours. Based on these findings, this study provides recommendations to various stakeholders. University administrators are encouraged to implement educational programmes and initiatives that raise awareness about the health risks associated with overweight and obesity. Health science colleges can integrate obesity prevention and management courses into their curricula and provide training on the application of the HBM for obesity management interventions. Science and humanities colleges should promote interdisciplinary approaches and collaborations to address obesity management issues comprehensively. Student support services can offer counselling and support groups to address psychological and emotional aspects related to body image and self-esteem while providing resources and guidance on nutrition and exercise.

Author affiliations
[1]Department of Family and Community Medicine, College of Medicine, Jazan University, Jazan, Saudi Arabia
[2]Department of Surgery, College of Medicine, Jazan University, Jazan, Saudi Arabia
[3]Health Research Centre, Jazan University, Jazan, Saudi Arabia
[4]Department of Obstetrics and Gynecologicy, College of Medicine, Jazan University, Jazan, Saudi Arabia
[5]College of Medicine, Jazan University, Jazan, Saudi Arabia

Acknowledgements The authors are grateful to the participants of this study. The authors extend their appreciation to the Deputyship for Research and Innovation, Ministry of Education in Saudi Arabia for funding this research work through the project number ISP23-47.

Contributors OA and SIA: conceptualisation, methodology, formal analysis, validation, data curation, investigation, resources, funding acquisition, supervision, project administration, writing—original draft preparation and writing—review and editing. AYA, AA, AOA, AAAA, IEM, AMSH, NH, MHM, RIA and AHH: formal analysis, validation, data curation, investigation, resources, funding acquisition, project administration, writing—original draft preparation and writing—review and editing. All authors have read and agreed to the published version of the manuscript.

Funding This research was funded by Deputyship for Research and Innovation, Ministry of Education in Saudi Arabia (grant number ISP23-47).

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Consent obtained directly from patient(s)

Ethics approval This study involves human participants and was approved by Standing Committee for Scientific Research—Jazan University (HAPO-10-Z-001), Saudi Arabia (Reference No.: REC-44/06/463). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. 'Not applicable'.

ORCID iD
Osama Albasheer http://orcid.org/0000-0002-5115-6182

REFERENCES

1 Nuttall FQ. Body mass index: obesity, BMI, and health: a critical review. *Nutr Today* 2015;50:117:117–28:.
2 Weir CB, Jan A. BMI classification Percentile and cut off points. 2019.
3 Bhurosy T, Jeewon R. Overweight and obesity epidemic in developing countries: a problem with diet, physical activity, or socioeconomic status. Sci World J 2014.
4 Hales CM, Carroll MD, Fryar CD, *et al*. Prevalence of obesity among adults and youth: United States, 2015–2016. *NCHS Data Brief* 2017;1–8.
5 Marques A, Peralta M, Naia A, *et al*. Prevalence of adult overweight and obesity in 20 European countries, 2014. *Eur J Public Health* 2018;28:295–300.
6 Puska P, Nishida C, Porter D, *et al*. Obesity and overweight. World Health Organization; 2003.1–2.
7 Karabulut US, Romero Z, Conatser P, *et al*. Assessing overweight/obesity, dietary habits, and physical activity in hispanic college students. *Exerc Med* 2018;2:5.
8 Cheng L, Liu Z. Differences of food intakes with gender, the year in college and body mass index among university students in Beijing, China. *BFJ* 2019;ahead-of-print:2524–34.
9 El Azab EF, Elwasefy SA, Shaban HE, *et al*. Obesity related risk factors among the Saudi female students in Jouf University. JHMN 2019;4:38–49.
10 Alfadda AA, Al-Dhwayan MM, Alharbi AA, *et al*. The Saudi clinical practice guideline for the management of overweight and obesity in adults. *Saudi Med J* 2016;37:1151–62.
11 Heymsfield S, Aronne LJ, Eneli I, *et al*. Clinical perspectives on obesity treatment: challenges, gaps, and promising opportunities. *NAM Perspectives* 2018;8.
12 Burgess E, Hassmén P, Pumpa KL. Determinants of adherence to lifestyle intervention in adults with obesity: a systematic review. *Clin Obes* 2017;7:123–35.
13 Lazzeretti L, Rotella F, Pala L, *et al*. Assessment of psychological predictors of weight loss: how and what for *World J Psychiatry* 2015;5:56–67.
14 Faghri P, Simon J, Huedo-Medina T, *et al*. Effects of self-efficacy on health behavior and body weight. *Journal of Obesity & Weight Loss Therapy* 2016;6.
15 Hays LM, Finch EA, Saha C, *et al*. Effect of self-efficacy on weight loss: a psychosocial analysis of a community-based adaptation of the diabetes prevention program lifestyle intervention. *Diabetes Spectr* 2014;27:270–5.
16 Champion VL, Skinner CS. The health belief model. *Health Behavior and Health Education: Theory, Research, and Practice* 2008;4:45–65.

17 Rosenstock IM. Historical origins of the health belief model. Health Educ Monogr 1974;2:328–35.
18 Shahrabani S, Benzion U, Yom Din G. Factors affecting nurses' decision to get the flu vaccine. *Eur J Health Econ* 2009;10:227–31.
19 Wong LP, Alias H, Wong P-F, *et al*. The use of the health belief model to assess predictors of intent to receive the COVID-19 vaccine and willingness to pay. *Hum Vaccin Immunother* 2020;16:2204–14.
20 Al-Hassan YT, Fabella E, Estrella E, *et al*. Utilizing the health belief model in determining the association between perceptions on obesity and exercise behavior of Saudi university students. *TOPHJ* 2020;13:87–93.
21 Agbo AA. Cronbach's alpha: review of limitations and associated recommendations. J Psychol Afr 2010;20:233–9.
22 Kaur R, Kumar R, Gupta M. Predicting risk of obesity and meal planning to reduce the obese in adulthood using artificial intelligence. *Endocrine* 2022;78:458–69.
23 Saghafi-Asl M, Aliasgharzadeh S, Asghari-Jafarabadi M. Factors influencing weight management behavior among college students: an application of the health belief model. *PLoS One* 2020;15:e0228058.
24 Pengpid S, Peltzer K. Prevalence of overweight and underweight and its associated factors among male and female university students in Thailand. *Homo* 2015;66:176–86.
25 Soliman NM, Elsayied H, Shouli MM. Application of health belief model among youth at high risk for obesity in West Bank (Palestine). Am J Nurs Sci 2018;7:86–96.
26 Méndez-Hernández P, Dosamantes-Carrasco D, Lamure M, *et al*. Weight-loss practices among university students in Mexico. *Int J Public Health* 2010;55:221–5.
27 Senekal M, Lasker GL, van Velden L, *et al*. Weight-loss strategies of South African female university students and comparison of weight management-related characteristics between dieters and non-dieters. *BMC Public Health* 2016;16.
28 O'Brien K, Venn BJ, Perry T, *et al*. Reasons for wanting to lose weight: different strokes for different folks. *Eat Behav* 2007;8:132–5.
29 Derksen R, Brink-Melis W, Westerman M, *et al*. Implementing a national integrated health care standard on obesity in a local primary care setting: focus groups give necessary insights. *Fam Pract* 2012;29:i177–84.
30 Visscher TLS, Lakerveld J, Olsen N, *et al*. Perceived health status: is obesity perceived as a risk factor and disease *Obes Facts* 2017;10:52–60.
31 Carruba MO, Busetto L, Bryant S, *et al*. The European Association for the study of obesity (EASO) endorses the Milan charter on urban obesity. *Obes Facts* 2021;14:163–8.
32 Stutts WC. Physical activity determinants in adults: perceived benefits, barriers, and self efficacy. *AAOHN J* 2002;50:499–507.
33 Emery CF, Olson KL, Lee VS, *et al*. Home environment and psychosocial predictors of obesity status among community-residing men and women. *Int J Obes* 2015;39:1401–7.
34 Huang H-T, Kuo Y-M, Wang S-R, *et al*. Structural factors affecting health examination behavioral intention. *Int J Environ Res Public Health* 2016;13:395.
35 Deshpande S, Basil MD, Basil DZ. Factors influencing healthy eating habits among college students: an application of the health belief model. *Health Mark Q* 2009;26:145–64.
36 Park D-Y. Utilizing the health belief model to predicting female middle school students' behavioral intention of weight reduction by weight status. *Nutr Res Pract* 2011;5:337–48.