

Knowledge, Attitude, and Belief of Healthcare Professionals Toward Obesity Stigmatization

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Objective: Obesity stigmatization, defined as the social devaluation and denigration of individuals because of their excess weight, represents a significant barrier to effective healthcare delivery. This study aimed to investigate healthcare professionals' knowledge about obesity-related health impacts, attitudes regarding weight bias (negative or discriminatory attitudes toward individuals with obesity), and beliefs about the causes and nature of obesity.

Methods: This cross-sectional study was conducted among healthcare professionals between Jan, 2024 and Feb, 2024 in The Department of General Medicine, Chengdu Second People's Hospital, using a self-designed questionnaire.

Results: A total of 388 valid questionnaires [303 (78.09%) female and a mean age of 37.71 ± 8.46 years] were included. The mean scores for knowledge, attitude, and belief were 6.70 ± 1.46 (possible range: 0–10), 38.41 ± 5.09 (possible range: 8–48), and 63.53 ± 15.35 (possible range: 0–120), respectively. Multivariate logistic regression analysis revealed that having body mass index ≥ 24.0 kg/m² (OR = 0.537, 95% CI: 0.331–0.873, P = 0.012) and nurse profession (OR = 0.546, 95% CI: 0.338–0.883, P = 0.014) were independently associated with knowledge. Knowledge (OR = 0.754, 95% CI: 0.600–0.949, P = 0.016), belief (OR = 0.915, 95% CI: 0.854–0.980, P = 0.011), and age (OR = 0.950, 95% CI: 0.906–0.995, P = 0.031) were independently associated with attitude. Moreover, structural equation modeling showed that knowledge had a significant direct effect on both belief ($\beta = 0.845$, P < 0.001) and attitude ($\beta = -0.944$, P < 0.001), as well as belief on attitude ($\beta = -0.550$, P < 0.001).

Conclusion: Healthcare professionals exhibited insufficient knowledge, negative attitude and belief toward obesity stigmatization. A pressing necessity arises for the implementation of targeted educational interventions and awareness programs within healthcare settings.

Keywords: knowledge, belief, attitude, healthcare professional, obesity stigmatization, cross-sectional study

Introduction

Obesity, defined by the World Health Organization as a body mass index (BMI) ≥ 30 kg/m², has become a major public health concern.¹ The rising rates of obesity are alarming, as they are linked to an increased risk of chronic diseases, such as cardiovascular disease (CVD), diabetes, stroke, and cancer. These conditions are significant contributors to global mortality, accounting for approximately 4.8% of deaths worldwide.^{2,3} The health implications of obesity go beyond physical health. Individuals with obesity often face mental health challenges and psychosocial difficulties. They experience widespread discrimination and stigmatization, which significantly affects their mental well-being.⁴ Healthcare professionals' perspectives warrant particular attention for several reasons. First, they are at the forefront of obesity management and their attitudes directly influence treatment outcomes.^{5,6} Second, their professional authority makes their beliefs particularly influential in shaping patients' self-perception and treatment adherence. Third, healthcare settings often represent critical points of intervention where stigmatization can either be perpetuated or actively addressed.^{7,8} Understanding and improving healthcare professionals' knowledge, attitudes, and beliefs is therefore fundamental to developing effective anti-stigma interventions in healthcare settings. Obesity discrimination manifests uniquely in children, who face stigmatization in educational settings,

peer relationships, and family environments.⁹ Such early-life discrimination can significantly impact their social development, academic performance, and long-term psychological well-being.^{10,11} Studies have shown that individuals with obesity experience widespread discrimination across multiple life domains. In healthcare settings, this discrimination may manifest as reduced quality of care; in employment, it often appears as decreased job opportunities and lower wages; in social relationships, it frequently leads to isolation and reduced social support.¹² The consequences of obesity discrimination extend beyond social impacts, affecting both psychological and physical health. Psychologically, individuals experiencing weight stigma often exhibit increased rates of depression, anxiety, and poor self-esteem. Physically, discrimination-related stress can lead to elevated cortisol levels and adverse cardiovascular responses.^{13,14} Obesity stigmatization in healthcare settings can significantly impact the quality and standard of clinical care. Studies have shown that weight bias among healthcare providers may lead to shortened consultation times, reduced therapeutic alliance, and delayed or avoided medical visits by patients, ultimately compromising healthcare outcomes.¹⁵ Beyond individual health implications, obesity poses substantial economic burden on healthcare systems and society at large.¹⁶

The “Knowledge-Attitude-Belief (KAB)” survey is a pivotal behavioral theory that has significantly influenced the understanding and modification of human health behaviors.¹⁷ This framework, emphasizing the interconnection between knowledge, attitude, belief, and practices, has been extensively utilized in the exploration of health behavior and decision-making processes.¹⁸ Healthcare professionals’ perspectives warrant particular attention for several reasons. First, they are at the forefront of obesity management and their attitudes directly influence treatment outcomes. Second, their professional authority makes their beliefs particularly influential in shaping patients’ self-perception and treatment adherence. Third, healthcare settings often represent critical points of intervention where stigmatization can either be perpetuated or actively addressed. Understanding and improving healthcare professionals’ knowledge, attitudes, and beliefs is therefore fundamental to developing effective anti-stigma interventions in healthcare settings. The attitude and belief of healthcare professionals play a critical role in patient care, directly impacting the quality of treatment and services provided to individuals with obesity. Recognizing and addressing any potential biases and stigmatization within this group toward obesity is crucial for enhancing the medical care experience and treatment outcomes for obese patients.

Despite numerous studies exploring the Knowledge-Attitude-Practice (KAP) concerning obesity,^{19–21} there remains a gap in research specifically targeting the current direction of understanding healthcare professionals’ knowledge, belief, and attitude toward obesity stigmatization. Addressing this gap, this study aimed to investigate knowledge, attitude, and belief among healthcare professionals toward obesity stigmatization.

Methods

Study Design and Participants

This cross-sectional study was conducted among healthcare professionals between Jan, 2024 and Feb, 2024 in the Department of General Medicine, Chengdu Second People’s Hospital. The inclusion criteria encompassed clinical healthcare professionals currently employed in the hospital who voluntarily consented to participate in the study. Conversely, medical students, residents in training, and healthcare professionals lacking appropriate qualifications were excluded from the study. The exclusion of medical students and residents was based on the study’s focus on healthcare professionals with independent clinical practice experience and established patterns of patient interaction. Ethical approval for this study was obtained from the Medical Ethics Committee of Chengdu Second People’s Hospital (approval No: 2024023), and informed consent was duly obtained from all study participants.

Questionnaire

The questionnaire design was informed by relevant literature^{22–25} and underwent refinement based on feedback from five endocrinology experts. A pilot study involving a small sample size (69 participants) was conducted, resulting in a reliability coefficient of 0.701. The final questionnaire, administered in Chinese, comprises four sections: demographic information [age, gender, body mass index (BMI, with obesity defined as BMI ≥ 30 kg/m² according to WHO criteria), education, occupation type, professional title, department, years of working], the knowledge dimension, the belief dimension, and the attitude dimension. The knowledge dimension encompassed a total of 10 questions, each scored 1

point for a correct response and 0 points for an incorrect answer, with a score range of 0–10. The belief dimension comprises 8 questions, employing a six-point Likert scale ranging from strongly agree (6 points) to strongly disagree (1 point), yielding a score range of 8–48. The attitude dimension consists of 20 questions, graded from strongly agree (+3 points) to strongly disagree (–3 points), with reverse scoring applied to items 2–6, 10–12, 14–16, and 19–20. The total score for all 20 items, plus 60 points, constitutes the attitude score, which spans from 0 to 120. A higher attitude score indicates a more positive or favorable attitude toward obese individuals, while a lower score signifies a negative or unfavorable attitude. Adequate knowledge, positive attitude, and strong belief are defined as achieving a total score exceeding 70% for each dimension.²⁶

Questionnaire Distribution and Quality Control

The study recruited medical professionals from various departments in hospitals located in the southeast (Sichuan province) and northwest regions of the country by coordinating with department heads to administer a questionnaire survey. While this sampling approach included geographical diversity, we acknowledge that it may not fully represent the perspectives of healthcare professionals across all regions of China. Questionnaires were distributed electronically to participants via WeChat and QQ groups for healthcare workers. An online survey platform, Sojump (<https://www.wjx.cn>), was utilized to deliver the questionnaires to healthcare professionals. Participants could access and complete the questionnaire by scanning a QR code using WeChat or by following a provided link. To ensure data quality and encourage comprehensive responses, a one-submission-per-IP address restriction was implemented, and all questionnaire items were made mandatory. Participants were guaranteed anonymity throughout the survey process. The research team, consisting of three doctors trained as research assistants responsible for questionnaire promotion and distribution, rigorously examined all submissions for completeness, internal consistency, and logical coherence. Investigators were well-versed in understanding the research questions and the survey process, which enhanced data accuracy and consistency. Questionnaires exhibiting logical errors, incomplete responses, or uniform answers across all items were categorized as invalid.

Sample Size Calculation

Ideally, the sample size should be a minimum of 5–10 times the number of predictors.^{27,28} Given that this questionnaire includes 38 independent variables, the required minimum sample size would be 190. To account for potential non-response, a 20% buffer is factored in, resulting in a final necessary sample size of 238.

Statistical Analysis

The statistical analyses were carried out using SPSS version 22 and AMOS version 22 (IBM, Armonk, NY, USA). Continuous variables were described using mean \pm standard deviation (SD), and between-group comparisons were performed using *t*-tests or analysis of variance (ANOVA). Categorical variables were presented as n (%). Pearson's correlation analysis was employed to assess the correlations between KAB scores. In multivariate analysis, 70% of the total score was used as the cut-off value. Univariate variables with $P < 0.05$ were enrolled in multivariate regression. Structural equation modeling (SEM) was utilized to test the hypotheses that 1) knowledge affects attitude, 2) knowledge impacts belief, and 3) attitude influences belief. Model fit was assessed using multiple indices including chi-square/degrees of freedom ratio (χ^2/df), comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). Values of $\chi^2/\text{df} < 3$, CFI and TLI > 0.95 , RMSEA < 0.06 , and SRMR < 0.08 indicate good model fit. Two-sided $P < 0.05$ were considered statistically significant in this study.

Results

Initially, a total of 402 questionnaires were returned, and the following were invalid: 3 cases classified as gender outliers, 3 cases with missing age information, 8 cases with BMI values exceeding 40, and 1 case identified as an outlier in terms of work experience. Consequently, a total of 388 valid questionnaires remained, with a validity rate of 96.52%. Among these, 303 respondents (78.09%) were female, the mean age were 37.71 ± 8.46 years. Additionally, 256 respondents (65.98%) had BMI of less than 24 kg/m², 239 (61.60%) held bachelor's degrees, 239 (61.60%) were doctors, 140 (36.08%) held intermediate

professional titles, and 176 (45.36%) belonged to the department of internal medicine. The mean years of working experience among participants was 14.05 ± 8.76 years. The mean scores for knowledge, belief, and attitude were 6.70 ± 1.46 (possible range: 0–10), 38.41 ± 5.09 (possible range: 8–48), and 63.53 ± 15.35 (possible range: 0–120), respectively. Subsequent analyses of demographic differences revealed that individuals with BMI < 24.0 kg/m² ($P = 0.033$) and those with a doctorate degree ($P = 0.012$) were more likely to have higher knowledge (Table 1).

In the domain of knowledge, the distribution of correctness rates revealed that the two knowledge items exhibiting the highest accuracy were as follows: “Obesity does not increase the risk of hypertension” (K8) with a correctness rate of 93.56%, and “People with a ‘beer belly’ have a higher risk of developing diabetes” (K1) with a correctness rate of 92.01%. Conversely, the two items with the lowest correctness rates were “To achieve significant health benefits after a person with obesity develops diabetes, it is necessary to lose at least 40% of body weight” (K3) with a correctness rate of 19.33%, and “Obesity increases the risk of food allergies” (K10) with a correctness rate of 23.45% (Supplementary Table 1).

Within the belief dimension, 51.55% of respondents concurred that individuals addicted to food typically become obese (B8), while 47.68% concurred that obesity is often the result of a physiological disorder (B2). Notably, the item “Obesity is rarely caused by a lack of willpower” (B7) stood out with 26.03% of respondents in agreement and 22.16% in disagreement, displaying a significant divergence in responses (Supplementary Table 2).

The attitude of healthcare professionals exhibited considerable variability, as indicated by 12.37% strongly agreeing that one of the worst outcomes for an individual is becoming obese (A20), 31.70% agreeing that extremely obese individuals tend to appear less well-groomed (A6), and 35.05% somewhat agreeing that a very small proportion of obese individuals would feel ashamed of their weight (A13). Conversely, 39.18% strongly disagreed that obese individuals should not expect to lead a normal life (A16), 39.43% disagreed that most obese individuals harbor resentment toward people of normal weight (A14), and 36.60% somewhat disagreed that obese individuals are typically sociable (A7) (Supplementary Table 3).

Table 1 Demographic Characteristics and KAB Score

	N (%)	Knowledge		Belief		Attitude	
		Mean \pm SD	Simple P	Mean \pm SD	Simple P	Mean \pm SD	Simple P
Total	388	6.70 ± 1.46		38.41 ± 5.09		63.53 ± 15.35	
Gender			0.213		0.280		0.351
Male	85 (21.91)	6.53 ± 1.50		37.88 ± 5.59		62.15 ± 14.92	
Female	303 (78.09)	6.75 ± 1.44		38.56 ± 4.93		63.91 ± 15.47	
BMI, kg/m²			0.033		0.719		0.634
Underweight and Normal (<24.0)	256(65.98)	6.82 ± 1.49		38.48 ± 4.96		63.79 ± 15.15	
Overweight and above (≥ 24.0)	132 (34.02)	6.48 ± 1.37		38.28 ± 5.35		63.01 ± 15.77	
Education			0.370		0.459		0.947
College and below	32 (8.25)	6.88 ± 1.41		38.09 ± 5.44		63.44 ± 13.46	
Bachelor's degree	239 (61.60)	6.65 ± 1.48		38.31 ± 5.19		63.75 ± 16.01	
Master's degree	79 (20.36)	6.63 ± 1.42		38.23 ± 4.61		63.54 ± 14.45	
Doctorate	38 (9.79)	7.05 ± 1.43		39.66 ± 5.09		62.13 ± 14.89	
Occupation			0.012		0.821		0.329
Doctor	239 (61.60)	6.85 ± 1.41		38.46 ± 5.10		62.92 ± 14.82	
Nurse	149 (38.40)	6.47 ± 1.50		38.34 ± 5.08		64.49 ± 16.17	
Professional title			0.151		0.255		0.357
No title /junior	119(30.67)	6.61 ± 1.46		38.01 ± 5.52		65.01 ± 15.65	
Intermediate	140 (36.08)	6.59 ± 1.54		38.97 ± 5.08		62.26 ± 15.39	
Senior (including associate senior)	129 (33.25)	6.91 ± 1.35		38.17 ± 4.64		63.53 ± 15.01	
Department			0.464		0.761		0.101
Internal medicine	176 (45.36)	6.78 ± 1.47		38.61 ± 4.97		61.70 ± 14.25	
Surgery	94 (24.23)	6.55 ± 1.30		38.15 ± 5.40		64.80 ± 16.82	
Other	118 (30.41)	6.70 ± 1.56		38.32 ± 5.03		65.23 ± 15.54	
Years of working (years)	14.05 ± 8.76						

Correlation analysis showed knowledge and belief exhibited a weak positive correlation ($r = 0.130$, simple $P = 0.010$). However, knowledge and attitude showed a significant negative correlation ($r = -0.125$, simple $P = 0.013$), as were belief and attitude ($r = -0.360$, simple $P < 0.001$).

Analyzing the distribution of scores, it was observed that 123 participants (31.70%) had a knowledge score exceeding 7, 322 participants (82.99%) had a belief score higher than 33.6, and 36 participants (9.28%) achieved an attitude score greater than 84. Multivariate logistic regression analysis revealed that having BMI ≥ 24.0 kg/m² (OR = 0.537, 95% CI: 0.331–0.873, $P = 0.012$) and nurse profession (OR = 0.546, 95% CI: 0.338–0.883, $P = 0.014$) were independently associated with knowledge (Table 2). Furthermore, knowledge (OR = 0.754, 95% CI: 0.600–0.949, $P = 0.016$), belief (OR = 0.915, 95% CI: 0.854–0.980, $P = 0.011$), and age (OR = 0.950, 95% CI: 0.906–0.995, $P = 0.031$) were independently associated with attitude (Table 3).

The model fit indices demonstrated excellent model fit ($\chi^2/df = 2.31$, < 3 ; CFI = 0.967, > 0.95 ; TLI = 0.956, > 0.95 ; RMSEA = 0.058, < 0.06 ; SRMR = 0.039, < 0.08) (Supplementary Table 4), indicating the proposed theoretical framework adequately explains the relationships among variables. SEM results revealed complex relationships among the three key variables. Knowledge showed a strong positive direct effect on belief ($\beta = 0.845$, simple $p < 0.001$), suggesting that increased knowledge levels are associated with stronger beliefs about obesity stigmatization. Interestingly, both knowledge and belief demonstrated significant negative effects on attitude ($\beta = -0.944$, simple $p < 0.001$ and $\beta = -0.550$, simple $p < 0.001$, respectively), indicating that higher levels of knowledge and stronger beliefs are associated with more negative attitudes toward obesity stigmatization. The model also revealed significant indirect effects, with belief partially mediating the relationship between knowledge and attitude (indirect effect = -0.465 , simple $p < 0.001$) (Table 4 and Figure 1).

Table 2 Univariate and Multivariate Analysis for Knowledge

	Univariate analysis		Multivariate analysis	
	OR (95% CI)	p	OR (95% CI)	p
Gender				
Male	Ref.			
Female	1.069(0.635 1.799)	0.803		
Age (years)	0.937(0.874 1.004)	0.063		
BMI, kg/m²				
Underweight and Normal (<24.0)	Ref.		Ref.	
Overweight and above (≥ 24.0)	0.580(0.361 0.931)	0.024	0.537(0.331 0.873)	0.012
Education				
College and below	Ref.			
Bachelor's degree	0.618(0.289 1.318)	0.213		
Master's degree	0.717(0.307 1.673)	0.442		
Doctorate	0.760(0.287 2.011)	0.580		
Occupation				
Doctor	Ref.		Ref.	
Nurse	0.557(0.352 0.880)	0.012	0.546(0.338 0.883)	0.014
Professional title				
No title /junior	Ref.			
Intermediate	0.994(0.581 1.700)	0.982		
Senior (including associate senior)	1.376(0.807 2.344)	0.241		
Department				
Internal medicine	Ref.		Ref.	
Surgery	0.522(0.296 0.920)	0.025	0.614(0.342 1.103)	0.103
Other	0.750(0.456 1.233)	0.256	0.739(0.446 1.225)	0.241
Years of working (years)	1.009(0.985 1.034)	0.462		

Table 3 Univariate and Multivariate Analysis for Attitude

	Univariate Analysis		Multivariate Analysis	
	OR (95% CI)	p	OR (95% CI)	p
Knowledge score	0.706(0.567 0.881)	0.002	0.754(0.600 0.949)	0.016
Belief score	0.902(0.843 0.964)	0.002	0.915(0.854 0.980)	0.011
Gender				
Male	Ref.			
Female	1.179(0.498 2.795)	0.708		
Age (years)	0.947(0.905 0.991)	0.019	0.950(0.906 0.995)	0.031
BMI, kg/m²				
Underweight and Normal (<24.0)	Ref.			
Overweight and above (≥24.0)	1.107(0.541 2.262)	0.781		
Education				
College and below	Ref.			
Bachelor's degree	3.948(0.518 30.097)	0.185		
Master's degree	2.548(0.294 22.056)	0.396		
Doctorate	1.722(0.149 19.918)	0.663		
Occupation				
Doctor	Ref.			
Nurse	1.687(0.848 3.357)	0.136		
Professional title				
No title /junior	Ref.			
Intermediate	0.462(0.203 1.051)	0.066		
Senior (including associate senior)	0.450(0.192 1.053)	0.066		
Department				
Internal medicine	Ref.		Ref.	
Surgery	2.407(1.033 5.609)	0.042	1.996(0.830 4.802)	0.123
Other	1.698(0.723 3.988)	0.224	1.866(0.766 4.544)	0.170
Years of working (years)	0.958(0.917 1.000)	0.053		

Table 4 SEM Results

			Estimate	simple P
Belief	<-	Knowledge	0.845	<0.001
Attitude	<-	Belief	-0.550	<0.001
Attitude	<-	Knowledge	-0.944	<0.001

Discussion

The study reveals that healthcare professionals exhibit insufficient knowledge, negative attitude, and negative belief toward obesity stigmatization, highlighting a concerning gap in their understanding and perceptions. To address this issue, it is essential to implement targeted training programs and interventions aimed at improving healthcare professionals' knowledge and promoting more empathetic and unbiased attitude toward individuals with obesity, ultimately fostering a more inclusive and supportive healthcare environment.

The findings of this study shed light on the prevailing knowledge, belief, and attitude of healthcare professionals toward obesity stigmatization, revealing a concerning gap in their understanding and perceptions. The results underscore the need for targeted interventions and educational programs within healthcare settings to address these issues effectively. The variations observed across different categories of healthcare professionals provide valuable insights into the factors influencing their perspectives. Firstly, the gender-based differences revealed that females exhibited higher scores in knowledge, belief, and attitude domains. This aligns with previous research suggesting that women tend to have more

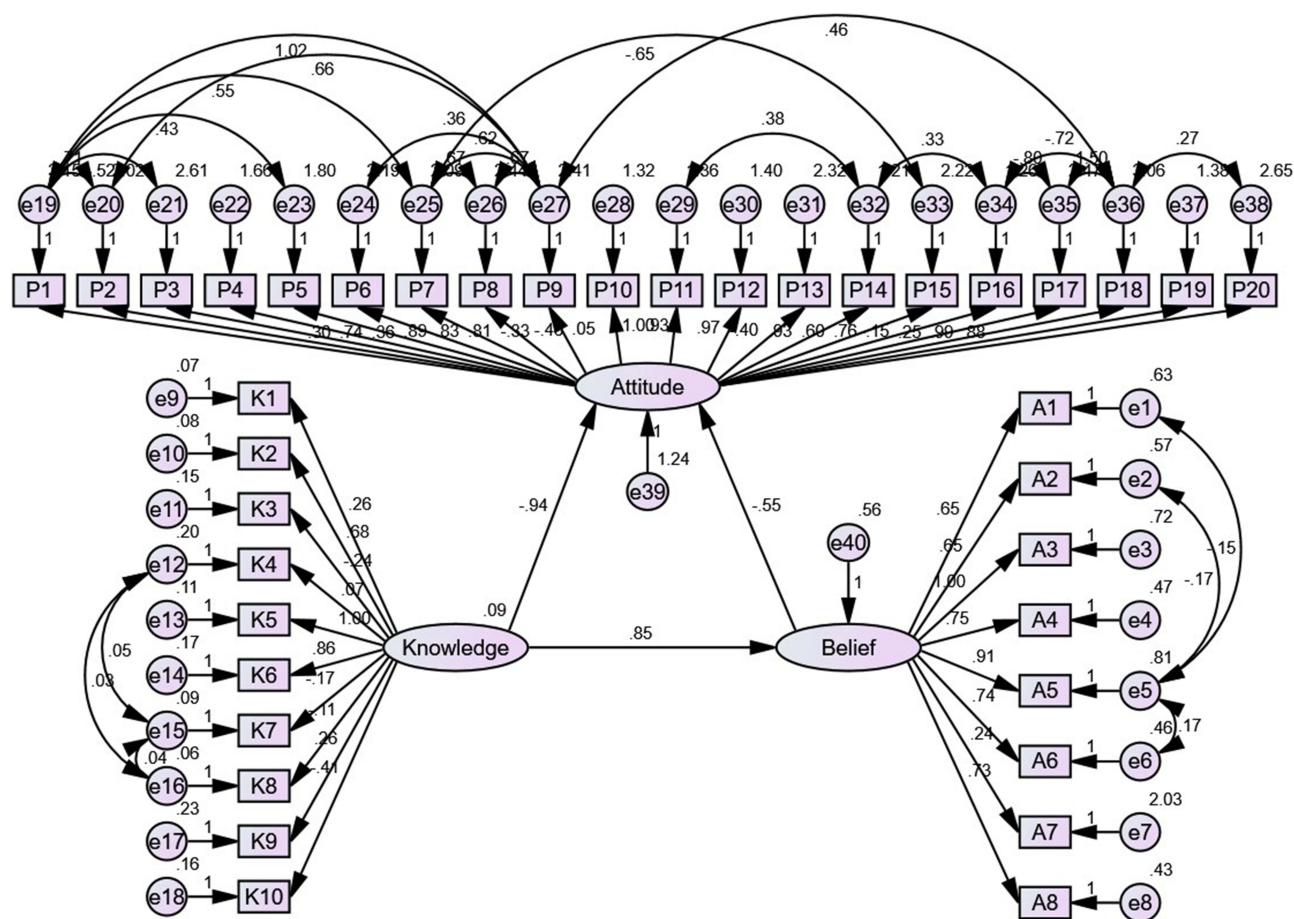


Figure 1 Structural equation model depicting the relationships between knowledge, attitude, and belief (KAB) of healthcare professionals toward obesity stigmatization. The model illustrates direct effects (solid lines with standardized coefficients) between variables. Single-headed arrows indicate the direction of influence. Numbers on paths represent standardized regression coefficients (β). Blue boxes represent observed variables. Positive coefficients indicate positive relationships, while negative coefficients indicate inverse relationships. The model demonstrates how knowledge directly influences both belief and attitude, and how belief affects attitude. All paths shown are statistically significant ($p < .001$).

empathetic attitude and greater awareness of the complexities surrounding obesity.^{29,30} In contrast, male healthcare professionals may benefit from tailored training programs addressing these disparities.

Additionally, the association between BMI and knowledge scores suggests that individuals with higher BMIs tend to have lower knowledge levels. This finding is consistent with previous studies highlighting the importance of addressing bias and misconceptions associated with obesity.^{31–33} Studies have reported similar knowledge deficits among healthcare providers, with particular gaps in understanding the complex etiology of obesity. Similar to our findings, previous research has found that providers with higher BMI showed lower knowledge scores, suggesting a potential link between personal weight status and professional understanding of obesity stigmatization.³⁴ Tailored educational initiatives targeting this knowledge gap should be considered. Occupational differences, with doctors demonstrating higher knowledge scores than nurses, underscore the need for specialized training in nursing education programs. The observed differences in knowledge scores based on BMI and professional roles warrant further discussion. Healthcare professionals with higher BMI might demonstrate different knowledge levels possibly due to their personal experiences with weight-related issues, which could influence their understanding and awareness of obesity stigmatization. This finding aligns with previous studies suggesting that personal weight status can affect healthcare providers' perspectives and approach to obesity management.³⁵ The knowledge difference between doctors and nurses might be attributed to variations in professional training, scope of practice, and patient interaction patterns.^{36,37} Doctors typically receive more extensive theoretical training in obesity pathophysiology and management, while nurses often have more frequent

direct patient contact and practical care experience.^{38,39} These distinct professional characteristics suggest the need for tailored educational interventions that address the specific needs and roles of different healthcare professionals. For instance, nursing education programs might benefit from enhanced theoretical content about obesity stigmatization, while physician training could focus more on practical application and patient communication skills.^{40,41} Collaboration between healthcare professions can facilitate knowledge exchange and foster more comprehensive understanding of obesity-related issues. Furthermore, participants with doctorate degrees exhibited higher knowledge scores, emphasizing the potential benefits of advanced education in promoting nuanced perspectives on obesity stigmatization.^{42,43} The negative attitudes observed in our study are consistent with previous research on healthcare professionals' weight bias. Studies have found comparable levels of negative attitudes among medical practitioners, with attitude scores consistently indicating the presence of weight bias.^{44,45} Our finding that older age is associated with more negative attitudes parallels previous research showing that experienced healthcare providers often hold more entrenched weight-related biases.

The observed correlations among knowledge, belief, and attitude indicate complex relationships among these constructs. While knowledge and belief displayed a positive correlation, knowledge and attitude were negatively correlated. This suggests that increasing knowledge alone may not necessarily lead to improved attitude. The relationship between knowledge and beliefs found in our structural equation model supports previous research that identified similar connections between healthcare providers' knowledge levels and their beliefs about obesity stigmatization. However, our finding that increased knowledge correlates with more negative attitudes contrasts with some previous studies. Research has found that higher knowledge levels were associated with more positive attitudes toward patients with obesity, suggesting that the relationship between knowledge and attitudes may be context-dependent.^{46,47} Addressing negative attitude requires a multifaceted approach that goes beyond factual information dissemination.^{48,49} The findings from the SEM underline the significance of knowledge in influencing belief and attitude, emphasizing the importance of knowledge-focused interventions.

In the knowledge dimension, it is encouraging to note that a majority of respondents correctly recognized the association between obesity and health risks such as diabetes and colorectal cancer, indicating a baseline level of awareness. However, there were misconceptions toward the necessity of extreme weight loss for health benefits and the life expectancy of obese individuals. Given the prevalence of misconceptions, such as the belief that extreme weight loss is necessary for health benefits, interventions should provide accurate and evidence-based information on the health risks associated with obesity. These educational programs should also address the life expectancy misconceptions and emphasize the importance of a nuanced understanding of obesity-related health outcomes. Providing healthcare professionals with up-to-date resources and access to continuing education opportunities can help bridge the knowledge gap and ensure that they are well-informed when addressing obesity-related concerns with patients.^{50,51}

Moving to the belief dimension, it is concerning to observe that a substantial proportion of healthcare professionals held stigmatizing belief related to obesity. Belief associating obesity with emotional compensation, physiological imbalances, and binge eating are indicative of negative stereotypes that can perpetuate stigmatization.^{52–54} Moreover, the notion that obesity is primarily caused by a lack of willpower or poor dietary habits reflects the need for targeted interventions to challenge these misconceptions. The belief that individuals may be addicted to food, akin to drug addiction, highlights the need for a nuanced understanding of the complex factors contributing to obesity. Educational programs should address the misconception that obesity is primarily a result of poor willpower or dietary habits by highlighting the multifactorial nature of obesity, including genetic, physiological, and environmental factors. Moreover, promoting empathy and sensitivity training can help healthcare professionals develop a more compassionate and non-judgmental approach when interacting with individuals with obesity. Encouraging self-awareness and reflection can also be beneficial in recognizing and addressing personal biases and belief that may affect patient care.^{55,56}

In the attitude dimension, the findings underscore the presence of negative attitude toward obese individuals among healthcare professionals. Belief that obese individuals are inferior, less successful in their work, and less likely to be chosen as partners for marriage are indicative of bias and stigma. These attitudes can have detrimental consequences for the quality of care provided to individuals with obesity, leading to disparities in healthcare outcomes. Additionally, the belief that obese individuals are more aggressive or emotionally expressive highlights the need to challenge these stereotypes, as they can influence healthcare professionals' interactions with their patients. Healthcare professionals should receive training on patient-centered care and communication skills, with a focus on reducing weight-based bias and discrimination. Additionally,

fostering collaboration among healthcare professions is essential to create a unified approach to addressing obesity-related issues. Interdisciplinary training and teamwork can help improve attitude by promoting a shared understanding of the challenges faced by individuals with obesity and the importance of a supportive healthcare system.^{57,58}

This study has several limitations that should be considered. First, the cross-sectional design limits our ability to establish causal relationships between variables and observe changes over time. Second, the self-reported nature of the data may introduce social desirability bias, particularly given the sensitive nature of stigmatization-related questions. Third, our sample was predominantly from two geographical regions, which may limit the generalizability of findings to other healthcare settings or regions. Finally, while we excluded medical students and residents to focus on practicing healthcare professionals, this decision may have limited our understanding of how attitudes and knowledge develop during professional training.

In conclusion, this study revealed significant gaps in healthcare professionals' knowledge, attitudes, and beliefs regarding obesity stigmatization. Specifically, we found that healthcare professionals with higher BMI and those in nursing roles demonstrated lower knowledge scores, suggesting the need for targeted educational approaches. The complex relationships identified through structural equation modeling, particularly the interactions between knowledge, beliefs, and attitudes, highlight the need for comprehensive intervention strategies. These findings indicate that merely increasing knowledge may not be sufficient to improve attitudes, and interventions should address both cognitive and affective components of obesity stigmatization. Based on these findings, we recommend implementing multi-faceted educational interventions that: (1) address profession-specific knowledge gaps, (2) challenge existing negative beliefs about obesity, and (3) promote positive attitudes through practical clinical scenarios. Future healthcare education programs should incorporate anti-stigma training, emphasizing patient-centered care approaches and evidence-based obesity management strategies. Regular assessment of healthcare professionals' attitudes and beliefs, coupled with continuous professional development in this area, may help create more supportive and effective healthcare environments for individuals with obesity.

Contribution to the Research Field

This study aimed to explore the knowledge, attitude, and beliefs of healthcare professionals regarding obesity stigmatization. Conducted between January and February 2024 among healthcare professionals at a specific hospital, the study found that participants generally had low scores in knowledge, exhibited negative attitudes, and held unfavorable beliefs towards obesity stigmatization. The findings highlighted that factors such as body mass index and profession influenced healthcare professionals' knowledge levels. Additionally, knowledge was found to directly impact both belief and attitude, while belief also influenced attitude. The results underscored the urgent need for focused educational initiatives and awareness campaigns within healthcare environments to address and counteract the prevalent biases and misconceptions surrounding obesity. The study's contribution lies in shedding light on the deficiencies in healthcare professionals' perspectives on obesity stigmatization and advocating for targeted interventions to foster a more empathetic and informed approach within the healthcare sector.

Data Sharing Statement

All data generated or analysed during this study are included in this published article.

Ethics Approval and Consent to Participate

I confirm that all methods were performed in accordance with the relevant guidelines. This work has been carried out in accordance with the Declaration of Helsinki (2000) of the World Medical Association. This study has been approved by the Medical Ethics Committee of Chengdu Second People's Hospital (No. 2024023), and informed consent was obtained from each patient.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors declare that they have no competing interests.

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