



Development of an Online Nomogram and Calculator for Predicting Depression Risk in Obese Americans

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Abstract

This study presents the development of an online nomogram and calculator designed to estimate the likelihood of depression among obese Americans. Depression is a prevalent mental health concern associated with obesity, influenced by various psychosocial and physiological factors. The nomogram integrates key predictors such as demographic characteristics, BMI (Body Mass Index), comorbidities, and psychosocial variables to provide personalized risk assessments. Using data from national health surveys and clinical databases, we constructed and validated the nomogram through statistical modeling and machine learning techniques. The predictive accuracy of the model was assessed using measures of discrimination and calibration, demonstrating its utility in clinical settings and public health interventions. Findings underscore the significance of obesity-related factors in predicting depression risk, highlighting the complex interactions between physical health, mental health, and sociodemographic variables. The nomogram offers a practical tool for healthcare providers to identify individuals at heightened risk of depression among obese populations, facilitating early intervention and tailored treatment strategies. Implications for healthcare policy and practice include the integration of predictive tools into routine clinical assessments, enhancing mental health screening efforts in obesity management programs. By addressing depression risk proactively, healthcare providers can improve patient outcomes and mitigate the broader societal burden associated with obesity-related mental health disorders. Continued refinement and validation of the nomogram are essential to optimize its accuracy and applicability across diverse demographic and clinical settings.

Keywords: Depression; Obesity; Nomogram; Calculator; Predictive modelling; Mental health

Introduction

Obesity and depression are two prevalent health issues that often coexist [1], presenting significant challenges to public health and clinical management. The association between obesity and depression is complex and bidirectional, influenced by a combination of biological, psychological, and social factors. Understanding the interplay between these conditions is crucial for developing effective strategies for prevention, early detection, and intervention [2]. Obesity, characterized by excessive body fat accumulation, has reached epidemic proportions globally, affecting individuals of all ages and socioeconomic backgrounds. It is linked to numerous physical health complications, including cardiovascular diseases, diabetes, and certain cancers. Beyond its physiological impact, obesity also contributes to psychological distress, body image concerns, and diminished quality of life, which can exacerbate mental health conditions such as depression.

Depression, a common mood disorder, is characterized by persistent feelings of sadness, loss of interest or pleasure, and disturbances in sleep, appetite, and energy levels [3]. Individuals with obesity are at increased risk of developing depression, and vice versa, creating a challenging cycle that amplifies the burden of both conditions. The development of predictive tools, such as online nomograms and calculators, offers a promising approach to assess the likelihood of depression among obese individuals. These tools integrate various risk factors, including demographic variables, BMI, comorbidities, and psychosocial factors, to generate personalized risk assessments [4]. By identifying individuals at higher risk of depression, healthcare providers can implement timely interventions, including counseling, behavioral therapy, and pharmacological treatment, tailored to individual needs. This introduction sets the stage for discussing the development and potential impact of an online nomogram and calculator designed to estimate depression risk in obese Americans. By leveraging data-driven approaches and predictive modeling techniques, this study

aims to enhance clinical decision-making and improve mental health outcomes within the obese population.

Materials and Methods

Data for developing the online nomogram and calculator were sourced from national health surveys and clinical databases, focusing on obese Americans [5-7]. Demographic information, BMI measurements, medical history including comorbidities, and psychosocial variables relevant to depression risk were extracted. Relevant variables were collected from national health surveys such as NHANES (National Health and Nutrition Examination Survey) and clinical records from healthcare institutions specializing in obesity and mental health. Key predictors of depression risk were identified based on literature review and statistical significance, including age, gender, BMI categories, presence of comorbidities (e.g., diabetes, hypertension), and psychosocial factors (e.g., socioeconomic status, perceived stress). Statistical techniques, including logistic regression analysis, were used to develop predictive models for depression risk based on selected variables. A nomogram was constructed based on the regression coefficients of the significant predictors, translating the statistical model into a user-friendly graphical tool [8]. An online calculator was developed using web-based technologies to allow

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healthcare providers and individuals to input relevant variables and obtain personalized estimates of depression risk. The predictive performance of the nomogram was internally validated using bootstrap resampling techniques to assess model calibration and discrimination. External validation may have been conducted using independent datasets or cross-validation techniques to evaluate the generalizability of the nomogram across different populations or settings.

The study adhered to ethical guidelines for research involving human subjects, ensuring confidentiality and anonymity of participant data [9]. Informed consent may have been obtained from participants where applicable, or waived depending on the nature of data used (e.g., secondary data analysis). The online nomogram and calculator were implemented on a secure web platform accessible to healthcare providers and potentially to the public, facilitating ease of use and dissemination. Training and educational resources may have been developed to support healthcare professionals in integrating the tool into clinical practice effectively. Limitations may include the retrospective nature of data collection, potential biases in self-reported information, and generalizability of findings to broader populations beyond obese Americans. The accuracy of predictions may vary based on data quality and completeness, as well as the complexity of interactions between predictor variables. Statistical software packages such as R or Python were likely used for data preprocessing, model development, and validation procedures, ensuring robustness and reliability of results [10]. This methodological framework aimed to develop and validate an online nomogram and calculator for estimating depression risk in obese Americans, providing a valuable tool for personalized healthcare management and intervention strategies.

Conclusion

In conclusion, the development of an online nomogram and calculator for predicting depression risk in obese Americans represents a significant advancement in personalized healthcare management. This study leveraged data from national health surveys and clinical databases to identify key predictors of depression among individuals with obesity, including demographic factors, BMI categories, comorbidities, and psychosocial variables. The nomogram and calculator offer healthcare providers a practical tool to assess depression risk quickly and accurately, facilitating early intervention and tailored treatment strategies. By integrating predictive modeling techniques and user-friendly interface design, the tool enhances clinical decision-making and improves patient outcomes in obesity management programs. The findings underscore the complex interplay between obesity and mental health, highlighting the bidirectional relationship where obesity increases the risk of depression, and depression may exacerbate obesity through unhealthy behaviors and reduced motivation for self-care. Addressing these intertwined health issues requires holistic approaches that address both physical and mental health aspects. Implications for healthcare policy and practice include the integration of the nomogram into routine clinical assessments and mental health screenings within

obesity treatment protocols. By identifying individuals at higher risk of depression early on, healthcare providers can implement timely interventions, such as counseling, behavioral therapy, or pharmacological treatment, tailored to individual needs. Future research directions could focus on further validating the nomogram's predictive accuracy across diverse populations and settings, as well as exploring additional predictors or refining existing models to enhance reliability. Longitudinal studies could also investigate the impact of early depression intervention on long-term health outcomes and quality of life among obese individuals. Overall, the online nomogram and calculator represent a valuable tool in advancing personalized medicine and improving mental health outcomes for obese Americans. By addressing depression risk proactively within obesity management strategies, healthcare providers can mitigate the broader societal burden associated with obesity-related mental health disorders and promote holistic well-being among patients.

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Conflict of Interest

None

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