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Exploring the Impact of Diabetes Mellitus and Hypertension on Depression in Youth: Insights from the Fasa Cohort

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Abstract

Background & Objectives: Depression frequently coexists with chronic conditions such as diabetes mellitus (DM) and hypertension (HTN), compounding health risks and complicating disease management. While this relationship is well-documented in adults, its dynamics among adolescents and young adults remain insufficiently explored, particularly in culturally diverse contexts. This study aimed to assess the prevalence and associations of major depressive disorder (MDD), DM, and HTN among individuals aged 15–34 years in Fasa, Iran.

Materials & Methods: A cross-sectional analysis was conducted on 3,014 participants from both rural and urban areas of Fasa. Data on depression, DM, and HTN were collected using validated self-report questionnaires and clinical assessments. Statistical analyses included Chi-square tests and logistic regression models to evaluate associations, adjusting for age, gender, smoking status, and other potential confounders.

Results: Depression and DM were more prevalent among males (30.2% and 2.1%, respectively) compared to females (20.4% and 1.2%), whereas HTN was more common among females (7.0%). Depression was significantly associated with HTN in both univariate (OR = 2.710) and multivariate (OR = 2.547) models. Age and smoking status emerged as significant predictors of depression. Although a potential association between depression and DM was identified in the univariate analysis, it did not remain statistically significant after adjustment.

Conclusion: This study highlights a significant gender-specific association between depression and HTN among youth, emphasizing the necessity for integrated, age-specific, and gender-sensitive mental and physical health interventions. No robust association was found between depression and DM.

Keywords: Depression, Diabetes Mellitus, Hypertension, Youth, Sociodemographic Factors

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Introduction

Depression is a significant global mental health disorder, with a lifetime prevalence affecting approximately 20% of the population. According to the World Health Organization (WHO), it has an estimated global prevalence

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of 5% and ranks as a leading cause of disability (1), second only to cardiovascular disease in terms of functional impairment (2). The burden of depression is particularly high among young individuals aged 10–24 years, contributing substantially to the global disease burden (3). Emerging evidence highlights a strong link between depression and chronic conditions such as diabetes and hypertension (HTN), especially within younger populations (4).

Type 2 diabetes mellitus (T2DM) is a major risk factor for depression, with individuals diagnosed with T2DM being significantly more likely to experience depressive symptoms than those without diabetes (5). Meta-analyses indicate that the prevalence of depression among T2DM patients increased from 20% in 2007 to 32% in 2018, with diabetes raising the risk of depression by 36–64% (6, 7). This comorbidity is associated with poor treatment adherence, reduced quality of life, elevated risk of diabetes-related complications, and increased mortality rates (8, 9). Furthermore, early-onset diabetes (diagnosed before the age of 40) is linked to more severe disease progression, higher rates of mental health disorders, and greater risk of hospitalization (10).

HTN, a leading risk factor for cardiovascular disease (CVD), is also closely associated with depression (11). A bidirectional relationship exists between these two conditions, in which individuals with HTN are more likely to experience depressive symptoms, and vice versa (12). This association is particularly concerning among young adults, as early-life exposure to these conditions may lead to long-term health complications (13). The rising prevalence of non-communicable diseases, especially in low- and middle-income countries (LMICs) such as Iran, underscores the need for a deeper understanding of the intersection between depression, diabetes, and HTN.

International research has consistently demonstrated a high prevalence of depression among individuals with diabetes, with rates significantly exceeding those in the general population (14). Meta-analyses show that up to 32% of T2DM patients experience depression, which adversely affects both disease progression and quality of life (15). Longitudinal studies suggest that low-grade systemic inflammation, marked by elevated inflammatory markers such as interleukin-6 (IL-6) and C-reactive protein (CRP), may serve as a common biological pathway linking depression, diabetes, and obesity (16, 17). Similarly, studies on HTN and depression have produced mixed findings—some report a direct association between high blood pressure and depression, while others suggest that low blood pressure may also be a risk factor (18, 19). Socioeconomic status, lifestyle behaviors, and genetic predispositions are recognized as mediating factors in these relationships (20, 21). Moreover, depression is increasingly acknowledged as an emerging risk factor for CVD, highlighting the interconnectedness of mental and cardiovascular health (22).

In Iran, several studies have examined the prevalence of depression among individuals with chronic conditions, particularly diabetes. Eskandari (2024) conducted a systematic review and meta-analysis, reporting a depression prevalence of 51.7% among Iranian T2DM patients. The study emphasized the need for targeted mental health interventions for this population (23). Similarly, Sedighi Pashaki (2019) found an overall depression prevalence of 54% among Iranian diabetic patients, with higher rates observed among women (24). Ghaemmohamadi (2018) explored the bidirectional relationship between HTN and depression, identifying a significant association—particularly among younger individuals—and highlighting the influence of lifestyle and socioeconomic factors (25). These findings align with international research, underscoring the complex interplay between metabolic and psychological disorders.

Despite the growing recognition of the

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interplay between depression, diabetes mellitus (DM), and HTN, research specifically examining these associations among younger populations in socioculturally diverse settings remains limited. Previous studies have often focused on older adults, neglecting the unique vulnerabilities and risk factors present in adolescents and young adults. This study aims to address this gap by investigating the prevalence and interrelationships of major depressive disorder (MDD), diabetes DM, and HTN among a cohort of individuals aged 15 to 34 years in Fasa, Iran.

Material and Methods

Participants

This study is a cross-sectional analysis of the Fasa Youth Cohort, including all 3,014 participants aged 15 to 34 years, from both the rural Sheshdeh region and the city of Fasa, located in eastern Fars Province, Iran. This figure represents the entire population of individuals participating in the Fasa Cohort Study. The study encompasses individuals from diverse ethnic backgrounds, including Fars, Turks, and Arabs, reflecting a range of lifestyle and cultural practices that may influence health status and risk factors for non-communicable diseases (NCDs). Participants, both male and female, were selected to represent the youth population within the specified age range, with ethical standards upheld by excluding anyone who chose to withdraw at any point during the study. The demographic diversity of the Fasa Youth Cohort, along with the region's heterogeneous healthcare systems, socioeconomic conditions, and environmental factors, provides valuable insights into the health behaviors and risk factors of this population.

Measurements

To assess MDD, the Composite International Diagnostic Interview (CIDI) 2.1 questionnaire—specifically designed based on the DSM-IV and ICD-10 criteria and validated within the Iranian general population (26, 27)—was employed. This questionnaire includes a section dedicated to MDD, comprising 20 yes/no questions designed to evaluate the presence of depressive symptoms. A diagnosis of MDD was established when at least 5 out of 20 items were answered affirmatively. The structure of the questionnaire is comprehensive: the initial two questions (E1 and E2) broadly address mood disorders and are essential for diagnosing MDD. Question E3 assesses energy levels; questions E4 to E7 examine appetite changes; and questions E8 and E9 evaluate sleep disturbances. Questions E10 and E11 assess psychomotor issues such as slowness and restlessness. Feelings of worthlessness or guilt are addressed in question E12, while questions E13 and E14 assess self-esteem. Cognitive difficulties are evaluated through questions E15 to E17, and the final three questions (E18 to E20) explore suicidal ideation and thoughts of death. Interviews were conducted by a clinical psychologist, who also delivered the final diagnosis of MDD, ensuring a comprehensive and clinically sound assessment of symptoms.

The diagnosis of diabetes was based on two primary criteria: self-report and fasting blood glucose measurements. Participants who reported a previous diagnosis of diabetes or had fasting blood sugar levels of ≥126 mg/dL were classified as diabetic. Similarly, HTN was diagnosed using both self-reports and objective blood pressure measurements. Participants with systolic blood pressure above 120 mmHg and diastolic pressure above 80 mmHg were categorized as hypertensive, regardless of their self-reported medical history.

Data collection

Data for this study were systematically collected through face-to-face interviews conducted by trained healthcare professionals, including clinical psychologists and local healthcare workers (Behvarz). Detailed information on participants' demographic characteristics (age, gender, marital status,

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education level), depression status, diagnoses of DM and HTN, as well as other relevant health variables, was gathered during these interviews. Substance use behaviors, including opium use, alcohol consumption, and smoking, were assessed through self-reports. Informed consent was obtained from all participants, who were thoroughly briefed on the study's objectives, procedures, and confidentiality protocols, in accordance with the ethical principles of the Declaration of Helsinki (1975, revised 2008). The study was approved by the Ethics Committee of Fasa University of Medical Sciences (approval code: IR.FUMS.REC.1402.169).

The cohort included individuals aged 15 to 34 years residing in both rural and urban areas of Fasa. Exclusion criteria were applied to individuals with physical or psychological impairments that hindered participation. Participants were selected through a population-based sampling method, covering rural communities in small towns and surrounding villages, as well as urban neighborhoods within the city of Fasa. Recruitment was conducted via household visits by local healthcare workers, who were trusted members of the community and facilitated participant engagement.

Data Analysis

For data analysis, all collected information was entered into Microsoft Excel, and unique codes were assigned to each participant to ensure privacy and anonymity. A Chi-square test was used to examine associations between depression and comorbid conditions such as DM and HTN, stratified by gender. Logistic regression analysis was conducted to assess the likelihood of co-occurrence of depression with DM and HTN, adjusting for potential confounding variables, including age, gender, marital status, education level, and lifestyle behaviors such as opium use, cigarette smoking, and alcohol consumption. Univariate and multivariate odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to quantify the strength and direction of these associations. Multicollinearity among predictor variables was assessed to ensure the robustness of the logistic regression models. All analyses were conducted using SPSS software, with statistical significance defined as $P < 0.05$.

Results

Table 1 presents the prevalence of MDD, DM, and HTN by gender in the study sample. The findings reveal notable gender differences in the prevalence of these conditions.

Regarding depression, 30.2% of males reported experiencing depressive symptoms, compared to 20.4% of females. The prevalence of MDD among males was significantly higher than that among females, with a greater proportion

Table 1. Prevalence of Depression, Diabetes Mellitus (DM), and Hypertension (HTN) by Gender

			Frequency	P value
Depression	Male	No	1218 (69.8)	0.000
		Yes	528 (30.2)	
	Female	No	1009 (79.6)	
		Yes	259 (20.4)	
DM	Male	No	1678 (97.9)	0.095
		Yes	36 (2.1)	
	Female	No	1217 (98.8)	
		Yes	15 (1.2)	
HTN	Male	No	1690 (96.8)	0.000
		Yes	56 (3.2)	
	Female	No	1179 (93.0)	
		Yes	89 (7.0)	

Abbreviations: DM: diabetes mellitus, HTN: hypertension

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of males reporting no symptoms of depression (69.8%) compared to females (79.6%). In terms of DM, both genders exhibited a low prevalence, with only 2.1% of males and 1.2% of females self-reporting a diagnosis of DM. The majority of participants in both groups (97.9% of males and 98.8% of females) did not report diabetes, highlighting a relatively low incidence of the condition in the study population. HTN was more prevalent than diabetes, with 3.2% of males and 7.0% of females diagnosed with HTN. A higher proportion of females (7.0%) had HTN compared to males (3.2%), indicating a gender disparity in the prevalence of high blood pressure. The majority of males (96.8%) and females (93.0%) had normal blood pressure readings.

In summary, the prevalence rates of depression, diabetes, and HTN vary by gender in the study sample, with males experiencing a higher prevalence of depression and females exhibiting a higher prevalence of HTN. These findings are consistent with broader health trends observed in rural populations and emphasize the need for gender-specific approaches in addressing mental and physical health concerns.

Table 2 illustrates the association between MDD and comorbidities—DM and HTN—stratified by gender. The data reveal distinct patterns in the co-occurrence of depression with both DM and HTN, although the associations are not statistically significant in most cases.

Among males, the prevalence of DM was slightly higher in those with depression (2.9%) compared to those without depression (1.8%), but this difference did not reach statistical significance (P = 0.13). Similarly, for HTN, a modest increase was observed among depressed males (4.2%) compared to their non-depressed counterparts (2.8%), though this result was also not statistically significant (P = 0.13).

Among females, the prevalence of DM was slightly higher in those with depression (1.6%) than in those without depression (1.1%), but the difference was not significant (P = 0.54). In contrast, the prevalence of HTN was higher among depressed females (9.7%) compared to non-depressed females (6.3%), and this difference approached statistical significance (P = 0.063), suggesting a potential trend toward an association between depression and HTN in females.

These findings suggest that although slight increases were observed in the prevalence of DM and HTN among individuals with depression, the overall associations were not statistically significant. However, the marginally significant result for HTN in females warrants further investigation, particularly in studies with larger sample sizes or more targeted subgroup analyses. Overall, the data suggest that depression may be associated with comorbid conditions such as DM and HTN, but the strength of these associations varies by gender and remains generally weak in this cohort.

Table 2. Relationship between Depression and Comorbidities (DM and HTN) Stratified by Gender

			Depression		P value
			No	Yes	
DM	Male	No	1173 (98.2%)	505 (97.1%)	0.13
		Yes	21 (1.8%)	15 (2.9%)	
	Female	No	970 (98.9%)	247 (98.4%)	0.54
		Yes	11 (1.1%)	4 (1.6%)	
HTN	Male	No	1184 (97.2%)	506 (95.8%)	0.13
		Yes	34 (2.8%)	22 (4.2%)	
	Female	No	945 (93.7%)	234 (90.3%)	0.063
		Yes	64 (6.3%)	25 (9.7%)	

Abbreviations: DM: diabetes mellitus, HTN: hypertension

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Table 3. Associations between Depression and Comorbidities of DM and HTN

		Univariate 95% C.I.	P value	Multivariate 95% C.I.	P value
DM	Depression	1.907 (1.045–3.482)	0.036	1.741 (0.931-3.232)	0.072
	Age	0.904 (0.846–0.965)	0.002	1.084 (1.020-1.157)	0.01
	Gender	1.802 (0.942–3.448)	0.075	0.521 (0.21-1.241)	0.14
	Marriage status	0.660 (0.403–1.080)	0.098	1.042 (0.546-1.958)	0.88
	Education level	1.645 (1.110–2.439)	0.013	1.469 (0.973-2.1997)	0.065
	Opium	1.620 (0.820–9.882)	0.54		
	Cigarette	1.061 (0.545–2.064)	0.862		
	Alcohol	1.118 (0.901–1.388)	0.31		
HTN	Depression	2.710 (1.623–4.527)	0.000	2.547 (1.513-4.337)	<0.001
	Age	0.928 (0.879–0.979)	0.006	1.057 (1.020-1.158)	0.024
	Gender	0.949 (0.566–1.589)	0.841		
	Marriage status	0.791 (0.505–1.238)	0.305		
	Education level	1.299 (0.899–1.876)	0.164	1.171 (0.81-1.721)	0.41
	Opium	2.618 (0.345–19.882)	0.352		
	Cigarette	1.973 (1.169–3.329)	0.011	2.072 (1.028-4.176)	0.040
	Alcohol	1.118 (0.901–1.388)	0.31		

Abbreviations: DM: diabetes mellitus, HTN: hypertension

Table 3 presents both univariate and multivariate associations between depression and comorbid conditions, including DM and HTN, while adjusting for demographic and lifestyle factors.

For the association between depression and DM, the univariate analysis revealed a significant relationship (OR = 1.907, 95% CI: 1.045–3.482, P = 0.036). However, in the multivariate model, the association became marginally non-significant (OR = 1.741, 95% CI: 0.931–3.232, P = 0.072). Depression was significantly associated with age in both the univariate (OR = 0.904, 95% CI: 0.846–0.965, P = 0.002) and multivariate models (OR = 1.084, 95% CI: 1.020–1.157, P = 0.01), indicating that younger participants were less likely to report depression. Gender did not show a significant relationship with depression in either model (univariate OR = 1.802, 95% CI: 0.942–3.448, P = 0.075; multivariate OR = 0.521, 95% CI: 0.21–1.241, P = 0.14). Educational level showed a significant association in the univariate model (OR = 1.645, 95% CI: 1.110–2.439, P = 0.013), but became borderline in the multivariate model (OR = 1.469, 95% CI: 0.973–2.199, P = 0.065).

Regarding HTN, depression was strongly associated with the condition in both the univariate (OR = 2.710, 95% CI: 1.623–4.527, P = 0.001) and multivariate models (OR = 2.547, 95% CI: 1.513–4.337, P < 0.001). Age was inversely associated with depression in both models (univariate OR = 0.928, 95% CI: 0.879–0.979, P = 0.006; multivariate OR = 1.057, 95% CI: 1.020–1.158, P = 0.024). Cigarette smoking was significantly associated with depression in both the univariate (OR = 1.973, 95% CI: 1.169–3.329, P = 0.011) and multivariate models (OR = 2.072, 95% CI: 1.028–4.176, P = 0.040). Other lifestyle factors, including opium use, alcohol consumption, and marital status, did not exhibit significant associations with depression in either model. These results underscore significant associations between depression and both DM and HTN, with age and cigarette smoking also playing notable roles in the observed relationships.

Discussion

This cross-sectional study investigated the prevalence and associations of MDD with DM and HTN in a sample of 3,014 individuals aged 15–34 years from the Fasa Youth Cohort in

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eastern Iran. Using the CIDI 2.1 questionnaire to diagnose MDD and clinical measures for DM and HTN, the study found notable gender differences: males had a higher prevalence of depression (30.2% vs. 20.4% among females), while females exhibited higher rates of HTN (7.0% vs. 3.2%). Associations between depression and DM or HTN were generally weak, though HTN showed a significant relationship with depression in both univariate and multivariate models. Age and cigarette smoking were also significant predictors of depression. These findings underscore the complex interplay between mental health and chronic conditions, highlighting the need for integrated, gender-sensitive healthcare approaches.

The studies conducted by Tran et al. (2021), Perry et al. (2020), and Dibato et al. (2022) underscore a significant association between depression and diabetes, especially among vulnerable populations. Tran et al. reported a notably high prevalence of depression among individuals with type 2 diabetes, which they attributed to low socioeconomic status, poor treatment adherence, and limited access to healthcare resources. They emphasized that depression exacerbated complications in diabetes management, leading to poorer glycemic control (28). Similarly, Dibato et al. focused on younger individuals with diabetes, noting an alarming increase in depression rates within this group. They suggested that the psychological distress caused by the chronic nature of diabetes and its lifestyle implications may contribute to this elevated risk (29). In contrast **to** these findings, our study identified a very low prevalence of diabetes among participants, with only 2.1% of males and 1.2% of females reporting the condition. While we observed a slight increase in diabetes prevalence among depressed participants, the association between depression and diabetes did not reach statistical significance. This discrepancy may stem from the low overall occurrence of diabetes in our study population, which contrasts with the higher rates reported in previous studies. Additionally, differences in sample demographics, such as age distribution, socioeconomic status, and regional healthcare access, may have influenced both the prevalence of diabetes and its relationship with depression.

Our findings regarding the association between depression and HTN align closely with the results of Jeon et al. (2020) and Boima et al. (2020), both of which examined the bidirectional relationship between these two conditions. Jeon et al. observed that while higher blood pressure appeared to initially reduce the risk of depression, prolonged depression significantly increased the likelihood of developing hypertension over time. They hypothesized that physiological stress responses, including chronic inflammation and dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, contributed to this association (18). Similarly, Boima et al. reported a 6.3% prevalence of depression among hypertensive patients, with older individuals being disproportionately affected. They suggested that aging-related stressors, such as declining health and social isolation, may exacerbate both conditions (30). In our study, we found a notably higher prevalence of HTN in females (7.0%) compared to males (3.2%), highlighting a gender disparity that warrants further exploration. Additionally, depression was significantly associated with HTN, with an OR of 1.532 and a p-value of 0.022, indicating a meaningful connection between the two conditions. A marginally significant trend was also observed among hypertensive females with depression (P = 0.063), further emphasizing the role of gender as a critical factor in this relationship. These findings are consistent with existing literature, suggesting that depression can increase the risk of HTN, particularly in older or female populations, potentially due to chronic stress, hormonal changes, and lifestyle factors such as reduced physical activity and unhealthy dietary habits.

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In summary, our study reveals a weaker association between depression and diabetes but a stronger link between depression and HTN, especially among female participants. Previous studies, including those by Tran, Dibato, Jeon, and Boima, have consistently reported significant associations between depression and chronic conditions such as diabetes and HTN (28-30). However, the relatively low prevalence of diabetes in our cohort likely influenced the lack of statistical significance in this relationship, which contrasts with the findings of these studies. In contrast, the strong association between depression and HTN observed in our study contributes to the growing body of evidence supporting the connection between mental health and cardiovascular conditions. Several factors, including age, gender, and education level, emerged as key predictors of these conditions, underscoring the importance of demographically nuanced analyses. For instance, female participants in our study exhibited both higher HTN prevalence and a stronger association with depression, suggesting that targeted interventions tailored to women could be particularly beneficial. Our findings also highlight the need for early screening and integrated healthcare approaches that address both mental and physical health comorbidities, particularly in populations with unique demographic or socioeconomic characteristics. By identifying these nuanced relationships, our study advances the understanding of the complex interplay between depression, diabetes, and HTN, providing a foundation for more effective prevention and treatment strategies.

The relationship between depression and blood pressure, as explored by Jeon et al. (2020) and Boima et al. (2020), is characterized by a complex interplay of physiological, psychological, and social factors. Jeon et al. (2020) emphasized a bidirectional relationship in which depression increases the risk of developing HTN, while high blood pressure may exert a protective effect against depression. One key mechanism proposed by Jeon et al. involves the central monoamine systems and neuropeptides, such as neuropeptide Y, which are thought to regulate both blood pressure and mood. Dysregulation of these neurophysiological systems can lead to imbalances in both blood pressure and depressive symptoms. For example, the use of antidepressants to enhance monoamine activity may result in elevated blood pressure, whereas depletion of these neurotransmitters can lead to both low blood pressure and depressive symptoms. Furthermore, chronic hypotension, often associated with lower neuropeptide levels, may induce psychological stress, potentially triggering the onset of depression (18). Boima et al. (2020) further elaborated on the role of external life stressors in the relationship between depression and HTN. They highlighted that life events, such as widowhood—especially among younger HTN individuals—can exacerbate both conditions. Stress from such significant life changes can elevate blood pressure while simultaneously contributing to depressive symptoms. Additionally, social determinants of health—such as lack of social support, economic hardship, and poor lifestyle choices—can amplify the risk of both depression and HTN (30). These factors suggest that the relationship between depression and blood pressure is not solely physiological but also influenced by a range of socio-environmental factors, making the mechanisms behind this association both multifactorial and complex.

Similarly, the relationship between depression and diabetes is multifaceted, with contributions from metabolic, psychological, and socio-environmental factors. Tran et al. (2021) examined how the chronic nature of T2DM contributes to depression, particularly among individuals under 60. The long-term burden of managing diabetes, including the risk of complications such as neuropathy and cardiovascular disease, can induce emotional

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distress, rendering younger individuals more susceptible to depression. Moreover, the emotional toll of living with a chronic condition that requires constant monitoring and treatment can exacerbate depressive symptoms. Socioeconomic factors, including low income, unstable employment, and limited access to healthcare, further heighten the likelihood of depression in diabetic patients. Stressful life events, such as job loss or relationship difficulties, can significantly elevate depressive symptoms in individuals with diabetes, creating a vicious cycle in which stress worsens both blood glucose control and mental health (28). Perry et al. (2020) proposed that metabolic dysfunction, particularly insulin resistance (IR), plays a pivotal role in this relationship. Insulin resistance occurs when cells become less responsive to insulin, often leading to elevated glucose and insulin levels, which are not only hallmarks of diabetes but also are linked to depressive symptoms, particularly in younger individuals. The study argued that metabolic factors such as elevated insulin and impaired glucose regulation may directly contribute to the development of depression. However, Perry et al. also underscored the importance of lifestyle interventions in mitigating both depression and metabolic dysfunction. Regular physical activity, a balanced diet, and improved management of diabetes through medication adherence serve as protective factors that can reduce the likelihood of depression (31). Dibato et al. (2022) focused on younger-onset diabetes (YOD), noting that individuals diagnosed with diabetes before age 40 face a significantly higher risk of developing depression compared to those diagnosed later in life. This increased vulnerability is attributed to the psychological burden of managing a chronic disease from a young age, often compounded by additional risk factors such as obesity. The bidirectional nature of this relationship is evident, as depression can interfere with diabetes management, leading to poor glycemic control and increased healthcare costs (29). These findings underscore the importance of proactive screening and management of depression in individuals with diabetes, particularly in younger patients, to improve both mental health outcomes and diabetes management.

Strengths and Limitations

One of the key strengths of this study is its focus on a population that includes both rural residents and individuals from the city of Fasa, a region that has been underrepresented in previous research on the relationship between depression, diabetes, and HTN. The study also provides valuable insights into gender differences, which have not always been consistently addressed in similar research. However, there are several limitations to consider. The cross-sectional design of the study limits the ability to draw causal conclusions about the relationship between depression and the chronic conditions investigated. Additionally, the low prevalence of diabetes in the study population may have influenced the lack of a significant association between depression and diabetes. Furthermore, the reliance on self-reported data for certain health conditions may introduce reporting bias. Future longitudinal studies with larger sample sizes and more geographically and socioeconomically diverse populations are needed to further explore these relationships and provide a more comprehensive understanding of how depression interacts with chronic diseases such as diabetes and HTN.

Conclusion

In conclusion, this study highlights the complex relationships between depression, diabetes, and HTN among youth in the Sheshdeh region and the city of Fasa, Iran, with particular emphasis on gender differences. While the association between depression and diabetes was weak, a significant link was found between depression and HTN, especially among female participants. These findings align with previous studies on the bidirectional relationship between depression

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and HTN, while differing from those that found stronger connections between depression and diabetes. Our results emphasize the need for gender-specific healthcare interventions and early screening to address both mental and physical health comorbidities in this mixed population. Although the study's cross-sectional design and the low prevalence of diabetes limit the ability to draw definitive causal conclusions, it underscores the importance of considering demographic and socioeconomic factors in future research. Longitudinal studies with larger, more diverse samples are needed to deepen our understanding of how depression interacts with chronic diseases, thereby informing more effective prevention and treatment strategies.

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Conflict of Interests

The authors declare no competing interests.

Abbreviations

DM: Diabetes Mellitus
HTN: Hypertension
MDD: Major Depressive Disorder
WHO: World Health Organization
T2DM: Type 2 Diabetes Mellitus
CVD: Cardiovascular Disease
LMICs: Low- and Middle-Income Countries
IL-6: Interleukin-6
CRP: C-Reactive Protein
NCDs: Non-communicable Diseases
CIDI 2.1: Composite International Diagnostic Interview
DSM-IV: Diagnostic and Statistical Manual of Mental Disorders (4e)
ICD-10: The International Classification of Diseases, Tenth Revision
OR: Odds Ratio
95% CI: 95% Confidence Intervals

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Ethical Considerations

Informed consent was obtained from all participants, who were fully briefed on the study's purpose, procedures, and confidentiality measures, in accordance with the ethical standards set forth in the Declaration of Helsinki (1975, revised 2008). The study received approval from the Ethics Committee at Fasa University of Medical Sciences.

Code of Ethices

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Author's Contributions

Zahra Keshavarz: Investigation
Mohammad Ebrahim Astaneh: Investigation, Writing - Review & Editing
Susan Darroudi: Conceptualization, Methodology
Amir Reza Khodaman: Investigation
Narges Fereydouni: Conceptualization, Writing - Original Draft

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References

1 Alaie I, Ssegonja R, Philipson A, von Knorring AL, Möller M, von Knorring L, et al. Adolescent depression, early psychiatric comorbidities, and adulthood

[DOI: 10.18502/jabs.v15i2.18084]

welfare burden: a 25-year longitudinal cohort study. SPPE. 2021;56(11):1993-2004.
2 Friedrich MJ. Depression Is the Leading Cause of Disability Around the World. JAMA. 2017;317(15):1517.
3 Hua Z, Wang S, Yuan X. Trends in age-standardized incidence rates of depression in adolescents aged 10–24 in 204 countries and regions from 1990 to 2019. J Affect Disord. 2024;350:831-7.
4 Herrera PA, Campos-Romero S, Szabo W, Martínez P, Guajardo V, Rojas G. Understanding the Relationship between Depression and Chronic Diseases Such as Diabetes and Hypertension: A Grounded Theory Study. Int J Environ Res Public Health. 2021;18(22):12130.
5 Zhu M, Li Y, Luo B, Cui J, Liu Y, Liu Y. Comorbidity of Type 2 Diabetes Mellitus and Depression: Clinical Evidence and Rationale for the Exacerbation of Cardiovascular Disease. Front Cardiovasc Med. 2022;9:861110.
6 Khaledi M, Haghighatdoost F, Feizi A, Aminorroaya A. The prevalence of comorbid depression in patients with type 2 diabetes: an updated systematic review and meta-analysis on huge number of observational studies. Acta Diabetol. 2019;56(6):631-50.
7 Elamoshy R, Bird Y, Thorpe L, Moraros J. Risk of Depression and Suicidality among Diabetic Patients: A Systematic Review and Meta-Analysis. J Clin Med. 2018;7(11):445.
8 Świątoniowska-Lonc N, Tański W, Polański J, Jankowska-Polańska B, Mazur G. Psychosocial Determinants of Treatment Adherence in Patients with Type 2 Diabetes - A Review. Diabetes Metab. Syndr. Obes.: Targets Ther. 2021;14:2701-15.
9 Ducat L, Philipson LH, Anderson BJ. The mental health comorbidities of diabetes. JAMA. 2014;312(7):691-2.
10 Strati M, Moustaki M, Psaltopoulou T, Vryonidou A, Paschou SA. Early onset type 2 diabetes mellitus: an update. Endocr. 2024;85(3):965-78.
11 Schaare HL, Blöchl M, Kumral D, Uhlig M, Lemcke L, Valk SL, et al. Associations between mental health, blood pressure and the development of hypertension. Nat Commun. 2023;14(1):1953.
12 Xu Z, Wu X, Xiao C, Zhang W, Yan P, Yang C, et al. Observational and genetic analyses of the bidirectional relationship between depression and hypertension. J Affect Disord. 2024;348:62-9.
13 Turana Y, Tengkawan J, Chia YC, Shin J, Chen CH, Park S, et al. Mental health problems and hypertension in the elderly: Review from the HOPE Asia Network. J Clin Hypertens. (Greenwich, Conn). 2021;23(3):504-12.
14 Koyama AK, Hora IA, Bullard KM, Benoit SR, Tang S, Cho P. State-Specific Prevalence of Depression Among Adults With and Without Diabetes - United States, 2011-2019. Prev Chronic Dis. 2023;20:E70.
15 Owens-Gary MD, Zhang X, Jawanda S, Bullard KM, Allweiss P, Smith BD. The Importance of Addressing Depression and Diabetes Distress in Adults with Type 2 Diabetes. J Gen Intern Med. 2019;34(2):320-4.
16 Drevets WC, Wittenberg GM, Bullmore ET, Manji HK. Immune targets for therapeutic development in depression: towards precision medicine. Nat Rev Drug Discov. 2022;21(3):224-44.
17 Osimo EF, Baxter LJ, Lewis G, Jones PB, Khandaker GM. Prevalence of low-grade inflammation in depression: a systematic review and meta-analysis of CRP levels. Psychol Med. 2019;49(12):1958-70.
18 Jeon SW, Chang Y, Lim SW, Cho J, Kim HN, Kim KB, et al. Bidirectional association between blood pressure and depressive symptoms in young and middle-age adults: A cohort study. Epidemiol Psychiatr Sci. 2020;29:e142.
19 Obas KA, Kwiatkowski M, Bytyci-Katanolli A, Statovci S, Jerliu N, Ramadani Q, et al. Prospective association between depressive symptoms and blood-pressure related outcomes in Kosovo. PLOS Glob Public Health. 2023;3(4):e0000851.
20 Remes O, Mendes JF, Templeton P. Biological, Psychological, and Social Determinants of Depression: A Review of Recent Literature. Brain Sci. 2021;11(12):1633.
21 Carey RM, Muntner P, Bosworth HB, Whelton PK. Prevention and Control of Hypertension: JACC Health Promotion Series. J Am Coll Cardiol. 2018;72(11):1278-93.
22 Levine GN, Cohen BE, Commodore-Mensah Y, Fleury J, Huffman JC, Khalid U, et al. Psychological Health, Well-Being, and the Mind-Heart-Body Connection: A Scientific Statement From the American Heart Association. Circul. 2021;143(10):e763-e83.
23 Eskandari S, Mohsenzadeh M, Khaleghi AA, Mohammadi M. Prevalence of Depression in Type 2 Diabetes Patients in Iran: A Systematic Review. Avicenna J Nurs Midwifery Care. 2024;32(2):107-17.
24 Pashaki MS, Mezel JA, Mokhtari Z, Gheshlagh RG, Hesabi PS, Nematifard T, et al. The prevalence of comorbid depression in patients with diabetes: A meta-analysis of observational studies. Diabetes Metab Syndr : Clin Res Rev. 2019;13(6):3113-9.
25 Ghaemmohamadi MS, Behzadifar M, Ghashghaee A, Mousavinejad N, Ebadi F, Saeedi Shahri SS, et al.

[DOI: 10.18502/jabs.v15i2.18084]

Prevalence of depression in cardiovascular patients in Iran: A systematic review and meta-analysis from 2000 to 2017. J Affect Disord. 2018;227:149-55.
26 Arabgol F, Alaghband Rad J, Sharifi V, Hakim-shoushtari M, Shabani A, Davari-Ashtiani R, et al. Reliability of a Persian translation of the Composite International Diagnostic Interview (CIDI), section for substance use disorders: In a multi-center study in Iran. Adv Cogn Sci. 2005;7(2):38-43.
27 Amini H, Alaghband Rad J, Sharifi V, Davari-Ashtiani R, K K, Shahrivar Z, et al. Validity of a Farsi translation of the composite International Diagnostic Interview (CIDI) to diagnose schizophrenia and bipolar disorder. TUMS. 2006;64:31-42. [In Persian]
28 Tran NMH, Nguyen QNL, Vo TH, Le TTA, Ngo NH. Depression Among Patients with Type 2 Diabetes Mellitus: Prevalence and Associated Factors in Hue City, Vietnam. Diabetes Metab Syndr Obes.: Targets Ther. 2021;14:505-13.
29 Dibato J, Montvida O, Ling J, Koye D, Polonsky WH, Paul SK. Temporal trends in the prevalence and incidence of depression and the interplay of comorbidities in patients with young- and usual-onset type 2 diabetes from the USA and the UK. Diabetol. 2022;65(12):2066-77.
30 Boima V, Tetteh J, Yorke E, Archampong T, Mensah G, Biritwum R, et al. Older adults with hypertension have increased risk of depression compared to their younger counterparts: Evidence from the World Health Organization study of Global Ageing and Adult Health Wave 2 in Ghana. J Affect Disord. 2020;277:329-36.
31 Perry BI, Khandaker GM, Marwaha S, Thompson A, Zammit S, Singh SP, et al. Insulin resistance and obesity, and their association with depression in relatively young people: findings from a large UK birth cohort. Psychol Med. 2020;50(4):556-65.

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