



The Association Between Non-medical Social Needs and the 10-Year Risk of Cardiovascular Diseases: A Population-based Study in Southeast of Iran

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Abstract

Background: Cardiovascular diseases (CVDs) are a leading global cause of mortality, with social determinants of health (SDH) significantly influencing outcomes. Non-medical social needs remain understudied in CVD risk assessment, particularly in underserved populations.

Objectives: This study examines the association between non-medical social needs and 10-year CVD risk among middle-aged adults in Zahedan, Iran.

Methods: A cross-sectional study was conducted in 2024 with 315 participants (aged 30 - 59) attending educational clinics of Zahedan University of Medical Sciences by convenience sampling. Data were collected using the World Health Organization (WHO) CVD Risk Prediction Chart and the WellRx Questionnaire (assessing social determinants). Logistic regression (Backward Model) analysis identified predictors of elevated CVD risk.

Results: In the analysis, four non-medical social determinants independently predicted high 10-year CVD risk ($\geq 20\%$): Trouble paying transportation costs [odds ratio (OR) = 4.54, 95% CI: 2.24 - 9.21, $P < 0.001$], reduction in food consumption (OR = 3.17, 95% CI: 1.57 - 6.37, $P = 0.001$), unsustainable job (OR = 2.60, 95% CI: 1.36 - 4.95, $P = 0.004$), and addiction (self or family member) (OR = 2.02, 95% CI: 1.11 - 3.69, $P = 0.022$).

Conclusions: Non-medical social needs strongly correlate with CVD risk in Zahedan. Targeted interventions – improving transportation, job security, reducing food insecurity, and expanding addiction support – could mitigate CVD burden. These findings advocate for integrating SDH into cardiovascular prevention strategies to advance health equity.

Keywords: Cardiovascular Diseases, Social Determinants of Health, Iran

1. Background

Cardiovascular diseases (CVDs) remain a leading cause of morbidity and mortality worldwide, contributing significantly to the global burden of disease. According to the World Health Organization's (WHO) Global Health Estimates 2019, non-communicable diseases (NCDs), including CVDs, accounted for approximately 74% of global deaths, with CVDs being the leading cause of mortality, responsible for nearly 18 million deaths annually (1). This represents a significant increase compared to previous decades,

reflecting a concerning upward trend driven by factors such as aging populations, prolonged exposure to risk factors, and shifts in lifestyle patterns (2-5). The CVDs are progressive conditions that often begin in childhood but manifest clinically in middle age or later, making them a critical public health challenge (6).

In Iran, CVDs are the leading cause of death, accounting for 46% of all deaths and 27.2% of years of life lost (YLL) in 18 provinces, with the age of onset declining in recent years (7, 8). The etiology of CVDs is influenced by both non-modifiable risk factors, such as age and

genetic predisposition, and modifiable risk factors, including lifestyle behaviors (e.g., physical inactivity, poor diet, smoking, and alcohol consumption) and physiological factors (e.g., hypertension, obesity, dyslipidemia, and diabetes) (9). Addressing these modifiable risk factors can significantly reduce the incidence of CVDs. For instance, eliminating all forms of CVD could increase life expectancy by approximately seven years (10).

However, beyond traditional biomedical risk factors, social determinants of health (SDH) play a pivotal role in shaping cardiovascular health. The SDH encompass a wide range of social, economic, and environmental factors, including income, education, employment, housing, and social support networks, which profoundly influence health outcomes (11). Emerging evidence highlights that social determinants, such as poverty, social isolation, and early-life conditions, are often more impactful than biological factors in determining health disparities and disease burden (12). For example, poverty exacerbates stress, particularly among vulnerable populations such as pregnant women, infants, children, and the elderly, thereby increasing the risk of CVDs and premature mortality (13).

In recent years, there has been a growing recognition of the importance of addressing non-medical social needs – such as food insecurity, housing instability, and lack of social support – in improving disease outcomes (14). Studies have shown that individuals with unmet social needs are at a higher risk of developing chronic conditions, including CVDs, and experience poorer health outcomes (15). Despite this, limited research has explored the relationship between non-medical social needs and the 10-year risk of CVDs, particularly in low- and middle-income countries (LMICs) like Iran, where social and economic disparities are pronounced.

This study was conducted in Zahedan, the capital of Sistan and Baluchestan province, one of the most underdeveloped and marginalized regions in Iran. The province faces significant socioeconomic challenges, including high poverty rates, limited access to healthcare, and low levels of education (16). These factors contribute to a high prevalence of unmet social needs, such as food insecurity, financial instability, and lack of job security, which are critical determinants of cardiovascular health (17). The region's underdevelopment is further exacerbated by inadequate infrastructure and limited economic opportunities, creating a cycle of poverty and poor health outcomes (18).

Understanding the association between non-medical social needs and CVD risk in this context can inform targeted interventions and policies to address the root causes of health disparities. By focusing on a marginalized population, this study contributes to the broader goal of achieving health equity and reducing the burden of CVDs in underserved regions.

2. Objectives

This study aims to fill this gap by examining the prevalence of non-medical social needs and their association with the 10-year risk of CVDs among middle-aged adults in Zahedan, Iran. By leveraging the Iranian Prevention Model (IRAPEN) for CVD risk assessment, this research seeks to provide actionable insights into the social determinants of cardiovascular health and inform targeted interventions to reduce CVD burden in underserved populations.

3. Methods

3.1. Study Design and Participants

This cross-sectional study was conducted in 2024 among patients attending the educational clinics of Zahedan University of Medical Sciences. The study population included individuals aged 30 - 59 years who were referred to these clinics for routine care. The sample size was calculated based on a study by Page-Reeves et al. (19), which reported a prevalence of at least one area of non-medical social need as 46%. Using a significance level of 0.05 and a margin of error of 0.09, the minimum sample size was estimated to be 118, by following the formula:

$$n = \frac{Z^2 p(1-p)}{e^2}$$

To enhance the study's power, we included 315 eligible participants. Sampling was performed using a convenience method based on inclusion criteria.

3.2. Ethical Consideration

The study protocol was approved by the Ethics Committee of Zahedan University of Medical Sciences based on the Declaration of Helsinki (ethical code: IR.ZAUMS.REC.1400.153). Written informed consent was obtained from all participants prior to their enrollment in the study. For participants who were illiterate, the consent form was read aloud in the presence of an impartial witness, and their thumbprint or signature was obtained to confirm voluntary participation.

3.3. Data Collection

Data were collected using two primary tools.

3.3.1. World Health Organization Cardiovascular Disease Risk Prediction Chart Based on Iranian Prevention Model

The IRAPEN is a validated, population-specific tool designed to assess CVD risk in Iran, incorporating local epidemiological and demographic factors. Aligned with the World Health Organization's Package of Essential Non-communicable Disease (WHO-PEN) interventions, IRAPEN supports primary healthcare strategies for early detection, risk stratification, and management of CVD – a key target in global efforts to reduce premature NCD mortality. By integrating locally relevant risk factors, IRAPEN enhances the scalability and precision of preventive measures in line with WHO-PEN's framework for low-resource settings (20). The WHO's CVD Risk Prediction Chart tool estimates the 10-year risk of CVD based on age, gender, history of type 2 diabetes, smoking status, total cholesterol levels, and systolic blood pressure. The calculated risk score categorizes participants into five groups: Low risk (<10%), moderate risk (10% - <20%), relatively high risk (20% - <30%), high risk (30% - <40%), and \geq very high risk (40%).

3.3.2. WellRx Questionnaire

This tool screens for SDH using 11 dichotomous (yes/no) questions, including food insecurity, housing, utilities, income, employment, transportation, education, substance abuse, child care, safety, and abuse (19). Since the WellRx Questionnaire had not been previously used in an Iranian population, it was translated into Persian, and its face and content validity were assessed. Content validity was evaluated by a panel of experts, including faculty members from the departments of community medicine and cardiology. The content validity ratio (CVR) – which evaluates the essentiality of each item by expert consensus, with scores > 0.62 considered acceptable for 10+ experts – and the Content Validity Index (CVI) – which assesses the relevance of items on a scale of 0 - 1, with scores \geq 0.80 indicating strong validity – were 0.99 and 0.81, respectively. These results confirm robust content validity for the instrument. Reliability was assessed using Cronbach's alpha in a pilot study involving 20 patients, yielding a value of 0.75, which confirmed acceptable internal consistency.

3.4. Statistical Analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize participant characteristics. The chi-square test and logistic regression (Backward model) were used to assess the association between non-medical social needs and the 10-year risk of CVD. A P-value of < 0.05 was considered statistically significant.

4. Results

The study included 315 participants, with 58.4% (n = 184) classified as having a low 10-year CVD risk (<10%), 19.7% (n = 62) at moderate risk (10 - <20%), 10.8% (n = 34) at relatively high risk (20 - <30%), 7.6% (n = 24) at high risk (30 - <40%), and 3.5% (n = 11) at very high risk (>40%). As shown in Table 1, a significant difference was observed between genders (P = 0.012), with a higher proportion of males in the moderate-to-very-high-risk categories compared to females.

Due to the low frequency in the relatively high risk, high risk, and very high-risk groups, we categorized participants into two groups: Ten-year CVD risk < 20% and ten-year CVD risk \geq 20%. Table 2 presents the distribution of non-medical social needs and their association with 10-year CVD risk. Several social determinants were significantly associated with an elevated CVD risk (\geq 20%): Unsustainable job (29.1% vs. 12.5%, P < 0.001), income dissatisfaction (30.7% vs. 18.5%, P = 0.019), reduction in food consumption (31.7% vs. 8.9%, P < 0.001), trouble paying transportation costs (36.8% vs. 17.8%, P = 0.001), and substance abuse (self or family member) (31.9% vs. 17.9%, P = 0.006). No significant associations were found for education level (P = 0.098), home ownership (P = 0.175), trouble paying utility bills (P = 0.180), difficulty paying for childcare (P = 0.219), or lack of security in routine life (P = 0.286).

In the logistic regression analysis (Backward Conditional Model) for all variables (Table 3), the final model identified four non-medical SDH as statistically significant predictors of high 10-year CVD risk (\geq 20%) after adjusting for covariates. The analysis revealed that participants who reported trouble paying for transportation costs had dramatically higher odds of being in the high-risk CVD group. Specifically, they were 4.54 times more likely to have a high 10-year CVD risk than those without such financial transportation barriers (95% CI: 2.24 - 9.21, P < 0.001). Similarly, food insecurity was a strong predictor. Individuals who had to reduce their food consumption in the past two months had 3.17 times the odds of high CVD risk compared to those with secure food access (95% CI: 1.57 - 6.37, P = 0.001). Employment instability also showed a significant association. Having an unsustainable job was

Table 1. Ten-Year Risk of Cardiovascular Diseases in the Study Population Based on World Health Organization Classification ^a

Variables	Low (<10%)	Moderate (10% - <20%)	Relatively High (20% - <30%)	High (30% - 40%)	Very High (> 40%)	Total	P-Value
Male	84 (49.1)	41 (21)	22 (8)	15 (9.1)	6 (3.6)	165	0.012
Female	103 (68.7)	21 (14)	12 (18.2)	9 (6)	5 (3.3)	150	
Total	184 (58.4)	62 (19.7)	34 (10.8)	24 (7.6)	11 (3.5)	315	

^a Values are expressed as No. (%).

associated with 2.60 times higher odds of high CVD risk (95% CI: 1.36 - 4.95, $P = 0.004$). Finally, the model identified substance abuse (in oneself or a family member) as a significant predictor, doubling the odds of high CVD risk [odds ratio (OR) = 2.02, 95% CI: 1.11 - 3.69, $P = 0.022$]. Multicollinearity was assessed using the variance inflation factor (VIF), and all values were below 5, confirming no significant multicollinearity among the predictors in the final model.

5. Discussion

This population-based study from Zahedan, Iran, reveals significant associations between non-medical social needs and 10-year CVD risk, providing crucial insights into health disparities in understudied populations. Our findings substantially expand the understanding of how social determinants operate in resource-limited settings characterized by unique socioeconomic challenges. Beyond identifying these key social risk factors, our analysis reveals how they are deeply interconnected, creating a complex web of mutually reinforcing disadvantages that disproportionately elevates cardiovascular risk in this vulnerable community.

5.1. Food Insecurity: The Foundational Stressor

Among the interconnected social risks we identified, the high prevalence of food insecurity (57.1% reporting reduced food consumption) and its strong association with CVD risk demands careful interpretation. This finding aligns with the work of Seligman et al. (21) in the United States, who first established the food insecurity-chronic disease link, though the pronounced association in our study likely reflects Zahedan's distinct economic context of international sanctions and food price volatility. This economic precarity not only affects nutrition but also exacerbates other social vulnerabilities. The dual-pathway model proposed by Gundersen and Ziliak (22) helps explain our findings, demonstrating how food insecurity harms health through both nutritional deficiencies and chronic stress activation – mechanisms that appear particularly

potent in our population. This constant stress and financial strain create a direct link to another significant finding: Employment instability. The biological pathways linking such stress to cardiovascular pathogenesis are further validated by recent work from Epel and Lithgow. (23).

5.2. Employment Instability: A Driver of Economic and Health Precarity

The increased CVD risk associated with job instability highlights critical structural vulnerabilities within the local labor market. The financial uncertainty stemming from such instability directly compounds the food insecurity discussed previously, limiting households' ability to afford nutritious food and manage other essential needs. While Stringhini et al. (24) across Europe found that precarious employment increased mortality risk, the stronger association in our study is a probable reflection of Iran's large informal economy, which often lacks the worker protections and social safety nets found in other regions. These findings strongly support Havranek's American Heart Association statement (25) and provide compelling evidence for the WHO's (26) emphasis on decent work conditions as a social determinant of health. Furthermore, the economic limitations imposed by food insecurity and unstable employment are manifested in the practical challenge of accessing resources, most notably through transportation barriers.

5.3. Transportation Barriers: Limiting Access to Care and Opportunity

The increased CVD risk associated with transportation struggles reveals a critical infrastructure gap that intensifies the impact of other social determinants. An individual facing food insecurity or job instability is further handicapped if they cannot reliably access healthcare facilities, affordable markets, or potential employment opportunities. While another study (27) in the United States found a higher CVD prevalence with transportation barriers, the pronounced association in our study reflects Zahedan's

Table 2. Distribution of Non-medical Social Needs in the Study Population

Categories; 10-Year CVD Risk (%)	No. (%)	P-Value
Education level		0.098
Illiterate	38 (12.1)	
< 20	33 (86.8)	
≥ 20	5 (13.2)	
Primary	88 (27.9)	
< 20	66 (75)	
≥ 20	22 (25)	
Secondary	111 (35.2)	
< 20	92 (82.9)	
≥ 20	19 (17.1)	
University	78 (24.8)	
< 20	55 (70.5)	
≥ 20	23 (29.5)	
Sustainable job		< 0.001
Yes	136 (43.2)	
< 20	119 (87.5)	
≥ 20	17 (12.5)	
No	179 (56.8)	
< 20	127 (70.9)	
≥ 20	52 (29.1)	
Income satisfaction		0.019
Yes	87 (27.6)	
< 20	185 (81.5)	
≥ 20	42 (18.5)	
No	228 (72.4)	
< 20	61 (69.3)	
≥ 20	27 (30.7)	
Home ownership		0.175
Yes	231 (73.3)	
< 20	176 (76.2)	
≥ 20	55 (23.8)	
No	84 (26.7)	
< 20	70 (83.3)	
≥ 20	14 (16.7)	
Reduction in food consumption (past 2 months)		< 0.001
Yes	180 (57.1)	
< 20	123 (91.1)	
≥ 20	12 (8.9)	
No	135 (42.9)	
< 20	123 (68.3)	
≥ 20	57 (31.7)	
Trouble paying utility bills		0.180
Yes	233 (74)	
< 20	147 (80.8)	
≥ 20	35 (19.2)	
No	82 (26)	
< 20	99 (74.4)	
≥ 20	34 (25.6)	
Trouble paying for child care		0.219
Yes	262 (83.2)	
< 20	178 (76.4)	
≥ 20	55 (23.6)	
No	53 (16.8)	
< 20	68 (82.9)	
≥ 20	14 (17.1)	
Transportation cost struggles		0.001
Yes	247 (78.4)	
< 20	43 (63.2)	
≥ 20	25 (36.8)	
No	68 (21.6)	
< 20	203 (82.2)	
≥ 20	44 (17.8)	
Substance abuse (patient or family member)		0.006
Yes	91 (28.9)	
< 20	62 (68.1)	
≥ 20	29 (31.9)	
No	224 (71.1)	
< 20	184 (82.1)	
≥ 20	40 (17.9)	
Lack of security in routine life		0.286
Yes	311 (98.7)	
< 20	4 (100)	
≥ 20	0	
No	4 (1.3)	
< 20	242 (77.8)	
≥ 20	69 (21.9)	

Abbreviation: CVD, cardiovascular disease.

severe mobility limitations, suggesting that interventions must address this critical access issue

Table 3. Predictive Non-medical Social Determinants of Health for 10-Year Cardiovascular Disease Risk by Logistic Regression Analysis (Backward Conditional Model)

Variables	OR	95% CI	P-Value
Unsustainable job	2.59	1.36 - 4.95	0.004
Reduction in food consumption (past 2 months)	3.16	1.57 - 6.37	0.001
Trouble paying for transportation costs	4.54	2.24 - 9.20	< 0.001
Substance abuse (patient or family member)	2.02	1.10 - 3.69	0.022

Abbreviations: OR, odds ratio.

alongside economic factors. The cumulative stress of navigating these intertwined challenges – food access, financial instability, and mobility – may also contribute to coping behaviors that further impact health, such as substance abuse.

5.4. Substance Abuse: A Potential Consequence and Contributing Factor

In our study, substance abuse (self or family member) had a significant association with ten-year CVD risk. This finding can be viewed as both a potential consequence of the immense psychosocial stress caused by the aforementioned social determinants and a direct contributing factor to cardiovascular pathology. This complex relationship is supported by several recent studies. Another study (28) found that individuals with a personal or family history of opioid substance abuse had an increased risk of developing CVD, while a meta-analysis by Lee and Kim [30] reported that a family history of alcohol use disorder was associated with a higher CVD risk. The work of Gomez-Ramos et al. (29), which found that substance dependence was linked to a higher CVD risk with smoking and alcohol being major contributors, further supports our results.

5.5. Synergistic Risks and Policy Imperatives: The Need for Integrated Solutions

The most critical insight from our study is the concentration of multiple social risks within this population, underscoring the necessity for comprehensive, integrated interventions rather than isolated programs. The interconnected nature of food insecurity, employment instability, transportation barriers, and substance abuse creates a complex web of mutually reinforcing disadvantages where the whole is greater than the sum of its parts. This accumulation of disadvantage powerfully supports the work of Marmot et al. (10), who demonstrated how risks cluster, and Patel et al. (30), who showed that multi-component programs are the most effective. These findings provide robust, localized evidence for global agendas, such as the

United Nations Development Programme's (31) goal to "leave no one behind" in health equity, arguing for policies that simultaneously address economic stability, food systems, infrastructure, and health services.

5.6. Conclusions

The SDH disproportionately elevate CVD risk in Zahedan compared to global benchmarks. Transportation barriers, food insecurity, employment instability, and substance abuse constitute particularly salient risk factors in this resource-limited setting. By addressing these social determinants, we may substantially reduce CVD disparities in Zahedan and similar underserved populations worldwide. These findings advocate for a multidisciplinary approach to CVD prevention, involving social workers, public health professionals, and clinicians to address both medical and non-medical risk factors, thereby advancing health equity.

5.7. Limitations

While providing important new evidence, our study has limitations that future research should address. The cross-sectional design prevents causal inference, indicating a need for longitudinal studies to trace how these interconnected social risks influence CVD outcomes over time. Self-reported measures may introduce bias, and the use of objective biomarkers and administrative data would strengthen future work. Furthermore, the use of convenience sampling introduces potential selection bias. Finally, the complex interplay of these social factors warrants formal exploration through statistical tests of interaction and sensitivity analyses in future research to better understand the synergies between risks.

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Footnotes

Authors' Contribution: Data collection and curation: N. Z. and H. M.; Writing-original draft: S. S.; Writing-review and editing: N. S. and S. S.; Supervision: N. S.; Project administration: N. S.

Conflict of Interests Statement: The authors declare no conflict of interest.

Data Availability: The datasets generated and analyzed during the current study are not publicly available due to confidentiality agreements with participants and institutional policies. However, anonymized data may be made available from the corresponding author (Saeedeh Sarhadi) upon reasonable request and with permission from Zahedan University of Medical Sciences.

Ethical Approval: The study protocol was approved by the Ethics Committee of Zahedan University of Medical Sciences based on the Declaration of Helsinki (ethical code: IR.ZAUMS.REC.1400.153).

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