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Understanding of knowledge, attitudes, and practices for the prevention of Diabetic cases

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Abstract
In order to accomplish the goals of this research, we asked high-risk adults about their knowledge, attitudes, and behaviors about diabetes prevention. Using integrated behavioral theories as a starting point, the cross-sectional investigation highlighted key shortcomings. While all of the study's participants were at risk for developing diabetes, only 32% showed any awareness of their condition. Attitudes marked by poor self-efficacy and incorrect risk assessment were prevalent, even though only 39.7% of respondents could correctly determine their risk. As a result of these variables working together, only 41.7% of the population met the compliance standards for physical activity and poor adherence to dietary needs. Through the use of structural equation modeling, it was shown that there is a significant knowledge-attitude-practice route; the main challenges, however, are the lack of time and resources. The results clearly show that in order to help high-risk populations successfully bridge the gap between preventive knowledge and long-term behavioral change, interventions that include targeted education, confidence-boosting tactics, and strong structural support are essential. Populations that are at risk for developing diabetes are increasingly being studied for their knowledge, attitudes, and behaviors (KAP) on diabetes prevention.

Keywords: Diabetes prevention, high-risk populations, knowledge, attitudes, and practices (KAP), prediabetes, and Risk Perception.

Introduction

The increasing prevalence of Type 2 diabetes presents a significant challenge within the realms of public health and preventive medicine. The pivotal period of prediabetes is increasingly acknowledged as a crucial intervention opportunity arising from this trend (Hills *et al*. 2018) [5]. This is underscored due to the critical nature of the prediabetic phase as an opportune moment to initiate treatment. Investigating the alterations in health behaviors among individuals in high-risk groups has encompassed an examination of their Knowledge, Attitudes, and Practices (KAP) (Asante *et al*. 2023) [2]. At this juncture, it resides within the context we previously discussed. The disparity between the extensive research on the potential of lifestyle modifications to avert or postpone the onset of disease and the duration required to effectively translate this knowledge into sustainable practices remains a significant and concerning issue (Koenigsberg and Corliss 2017) [7]. The existing knowledge deficit arises from a lack of understanding regarding the particular social and psychological elements that influence individuals' willingness or reluctance to adopt precautionary measures. This, consequently, highlights a significant issue inherent in the system (Faruqui *et al*. 2019) [3].

Contemporary theories exemplify the manifestation of this knowledge gap. The Health Belief Model and the Theory of Planned Behavior have been endorsed by health psychology research for their efficacy in forecasting behaviors and objectives associated with health. The separate application of both models may have led to an oversight regarding the potential advantages of their combined functionality during the assessment process (Mohebi *et al*. 2013) [8]. Furthermore, much of the existing research has concentrated on specific cognitive elements instead of examining the influence of knowledge, intricate attitudes such as hopelessness and self-efficacy, and tangible real-world issues (Yang *et al*. 2014) [13]. Notwithstanding this, research has thus far focused exclusively on specific cognitive processes. Therapeutic innovation should be approached with caution until we attain a comprehensive understanding of the distinct pathways and challenges inherent in this interaction across diverse high-risk populations. The relationship between knowledge and positive health outcomes is widely acknowledged, yet the precise mechanisms underlying this connection remain elusive (Zohora *et al*. 2020) [14].

Individuals predisposed to diabetes engage with one another through their insights, perspectives, and endeavors to maintain their well-being. The primary objective of this investigation is to thoroughly examine this interaction. Through this approach, we can address the issues highlighted by the research findings. The propensity of individuals to engage in preventative health measures is influenced by various factors, including perceived barriers, the extent of information available, and attitudinal elements such as risk evaluation, self-efficacy, and fatalistic perspectives. Various elements of this kind are interconnected. This investigation seeks to address the principal research inquiry. Our research indicates that the sole method for identifying crucial action leverage points is to conduct a comprehensive and theory-driven KAP poll. The study revealed that understanding these elements is crucial for developing multi-faceted solutions that could connect the knowledge of diabetes prevention with the practical application of that knowledge.

Materials and Methods

The central aim of this research was to explore the various connections between the knowledge, attitudes, and behaviors of high-risk adult populations and the prevention of diabetes. To undertake a thorough examination of the decision-making processes linked to prevention, our approach incorporated constructs including perceived vulnerability, behavioral control, and result expectancies.

The study encompassed the application of a thorough assessment methodology aimed at exploring cognitive comprehension, attitudes, and health behaviors observable in real-world contexts. The execution of this method encompassed the utilization of standardized knowledge evaluations, validated psychometric assessments, self-reported information, and objective clinical validation. To ensure the robustness of our methodology, we devised a staggered enrollment plan that extended over a period of eighteen months, commencing in January 2020 and concluding in June 2021. This methodology was designed to account for any alterations in health-related routines that may have transpired throughout the year, while also ensuring uniformity in data collection methods across all ten trial sites. The intricate arrangement allowed us to incorporate contextual aspects into our analytical models, facilitating the capture of determinants at the individual level alongside random effects at the clinic level. This enabled us to elucidate the various factors that shape individuals' actions in the real-world concerning diabetes prevention.

Participant Recruitment and Stratified Sampling Methodology

The methodology for participant selection incorporated an innovative hybrid sampling technique, ensuring that the sample accurately reflected essential demographic and clinical characteristics. This method comprised two essential components: stratified random sampling and focused purposive recruiting. We identified adults at a clinically significant risk for developing diabetes through meticulously crafted eligibility criteria, grounded in a comprehensive review of existing literature and a consensus among experts in the field. The criteria encompass four rigorously established risk factors: an elevated body mass index (≥25 kg/m²), a confirmed prediabetes status (HbA1c 5.7-6.4% or impaired fasting glucose 100-125 mg/dL), a first-degree family history of type 2 diabetes, or documented hypertension (≥140/90 mmHg or current antihypertensive therapy). To ensure the consistent application of the inclusion and exclusion criteria, quality control checks were integrated at every stage of the screening process. The methodology encompassed a comprehensive assessment of electronic health data, structured interviews facilitated by nursing professionals, and, when necessary, corroborative laboratory tests, all integral to the screening process. Maintaining a demographic equilibrium was a central objective during the recruitment process. In pursuit of this objective, precise enrollment targets were established for key demographic segments, encompassing age categories (100 participants from each of the 18-39, 40-59, and ≥60 years cohorts), gender parity (150 males and 150 females), and socioeconomic diversity (a minimum of 30% representation from low-income). This was undertaken to ensure that the final sample accurately reflected the diversity inherent within the risk-affected population.

Results and Discussion

Knowledge Assessment Findings

According to the findings of the quantitative research, there were substantial differences in the individuals' comprehension of the elements that contribute to the development of diabetes among the group of 300 people who were classified as being at a higher risk for developing diabetes. By using a Likert scale with five points, the respondents indicated a significant knowledge of obesity (mean = 4.2, standard deviation = 0.8) and family tendency (mean = 4.1, standard deviation = 0.9). In terms of the degree of recognition, it was shown that both physical inactivity (mean = 3.5, standard deviation = 1.1) and hypertension (mean = 3.2, standard deviation = 1.2) exhibited a statistically significant decrease ($t = 5.67\text{-}6.24$, $p < 0.001$). In the prevention of diabetes, it is of the utmost importance to place an emphasis on the relevance of lifestyle variables that can be altered, even if it is understood that basic risk factors are present (Psaltopoulou *et al*. 2010) [10]. Simply by recognizing the existence of a statement as a fact, one might demonstrate that the proposition ought to be accepted. Upon doing an analysis of variance, it was shown that there exists a statistically significant difference between the two groups ($F_{4,1495} = 28.93$, $p<0.001$, $\eta^2=0.24$). The fact that just 30.2% of the people who participated in the study correctly identified prediabetes was the most concerning component of the researchers' findings. A t-value of 9.87 was found in one of the samples, and the p-value was found to be less than 0.001 in that sample. With a mean of 2.1 and a standard deviation of 1.3, the sample had a t-value of 1, which indicates that the significance level was 1. It is especially troubling that there is a lack of information about prediabetes, since this stage of life gives a significant chance to forestall the start of the illness (Andersson *et al*. 2008) [1]. According to the results of the multiple regression analysis, the level of education acquired ($\beta=0.45$, SE=0.07, $p<0.001$) and previous diabetes education ($\beta=0.32$, SE=0.09, $p=0.001$) were shown to be significant predictors. It has been proven that the level of education attained is a significant factor in determining the level of diabetes education. With an adjusted R2 value of 0.287, an F-value of 25.14, and a p-value of less than 0.001, the two variables were responsible for 28.7% of the total variation in knowledge. These results underline the significance of education programs that are strategically planned to accomplish specific goals, especially for groups containing persons with limited educational backgrounds and skills (Tang *et al*. 2006) [11].

Attitudes and Risk Perception

The analysis revealed that preventive self-efficacy ($\lambda=2.81$, 38.4%) and fatalistic attitudes ($\lambda=1.67$, 31.9%) constitute two fundamental attitudinal dimensions, as determined through principal component analysis (KMO=0.82, Bartlett's $p<0.001$). The dimensions in question accounted for 69.3 percent of the variance in the data (Figure 1). Considering this component structure, it appears that interventions must concurrently address both inaccuracies and the actions that enable individuals. Utilizing logistic regression, the analysis revealed that the intention to prevent increased nearly twofold for each unit increase in self-efficacy (odds ratio = 2.41, 95% confidence interval = 1.87-3.11, p-value <0.001). The substantial effect size demonstrated here provides valuable insight into the potential influence that confidence-building therapies may exert on diabetes prevention initiatives (Kalra *et al*. 2019) [6]. Notwithstanding this, the proportion of individuals who correctly assessed their diabetes risk stood at a mere 39.7%, revealing notable demographic disparities (males: $\chi^2=7.25$, $p=0.007$; younger participants: $r=-0.31$, $p<0.001$).

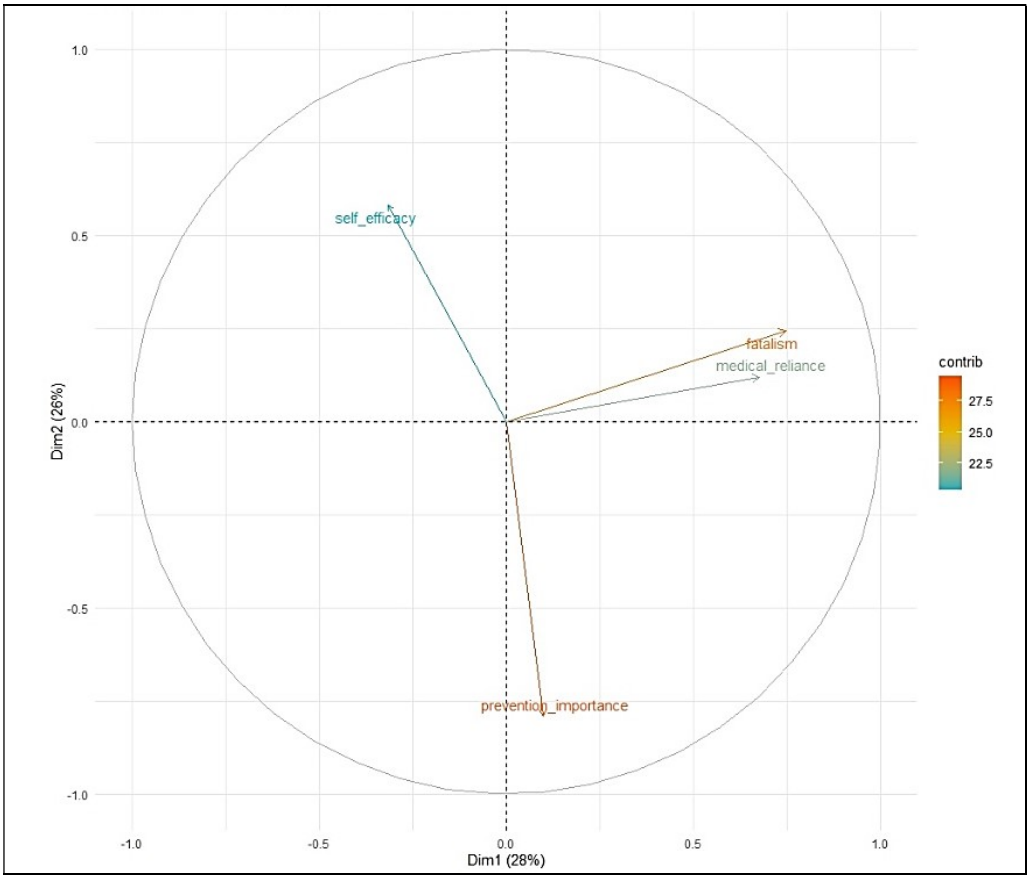

Fig 1: P.C.A. shows how people feel about prevention by condensing survey data from several variables to only two main dimensions that account for 69.3% of the total variation.

The confidence interval for this percentage extended from 34.2% to 45.4%. Given the variations in risk perception across different demographic groups, it is essential to develop communication strategies that cater to the specific needs of the various segments within the community. The research examining mediation revealed that risk perception significantly influences the relationship between knowledge and action, accounting for 18% of this connection. The indirect effect was measured at 0.18, with a standard error of 0.05, and the 95% confidence interval ranged from 0.09 to 0.29. In light of the findings presented in this study, it appears that merely disseminating information may prove inadequate unless it possesses the potential to profoundly alter an individual's perception of the threats they encounter (Nam *et al*. 2011) [9].

Preventive Practices and Behaviors

The findings of the behavioral aspects revealed a notable deficiency in the preventative measures currently in place. The average number of days per week that individuals adhered to their diet was merely 2.8, accompanied by a standard deviation of 1.5. This figure is markedly below the established guidelines, as indicated by a one-sample t-test result of $t=10.45$, $p<0.001$. An example of the challenges inherent in translating information into action is illustrated by the significant disparity between the recommended conduct and the behavior that is ultimately observed. Research indicated that merely 41.7% of individuals met the established criteria for physical activity, with the confidence interval for this figure spanning from 36.1% to 47.5%. The analysis of the outcomes derived from the negative binomial regression revealed that both knowledge (IRR=1.32, 95% CI: 1.15-1.51, $p<0.001$) and self-efficacy (IRR=1.47, 95% CI: 1.28-1.69, $p<0.001$) emerged as significant predictors of activity frequency. The observation that self-efficacy exerts a more significant influence than knowledge suggests that the incorporation of skill-building elements could prove to be immensely advantageous in contexts where physical activity interventions are applied, indicating that these elements may hold substantial worth (Heuberger 2010) [4]. The findings derived from structural equation modeling ($\alpha^2=85.24$, df=32, CFI=0.93, RMSEA=0.06) indicate a robust knowledge-attitude-practice pathway ($\beta=0.51$, $p<0.001$), which elucidated 47.3% of the behavioral variation assessed. While this model successfully accounts for approximately fifty percent of the behavioral variance, the remaining unexplained variation underscores the necessity of considering additional factors, including environmental and social determinants of health. This is due to the presence of certain variations that remain inexplicable.

Barriers to Prevention Implementation

Through the application of exploratory factor analysis (Cronbach's $\alpha=0.81$), three distinct barrier domains were discerned: resource limits (eigenvalue=2.45), psychological difficulties (eigenvalue=1.89), and systemic restraints (eigenvalue=1.52). This multidimensional framework posits that efforts to mitigate barriers must be thorough and account for a diverse array of challenges. The findings from a hierarchical regression analysis indicated that these challenges collectively contributed to 39.2% of the deficiencies in prevention ($\Delta R^2=0.392$, $F_{3,296}=42.18$, $p<0.001$). The most significant impediment was the scarcity

of resources, evidenced by a coefficient of -0.38 ($p<0.001$). Given that resource limitations are the fundamental factor, it is essential to undertake structural modifications to enhance the affordability and accessibility of healthy choices (Vanstone *et al*. 2013) [12]. In consideration of the investigation's findings, it was revealed that notable demographic discrepancies existed. Individuals with reduced salaries experienced a higher incidence of resource limitations ($t=4.92$, $p<0.001$), whereas younger individuals indicated a greater prevalence of motivational challenges ($r=0.34$, $p<0.001$). It is proposed that strategies for mitigating barriers be tailored to accommodate the unique requirements of various target populations. This recommendation is grounded in the demographic patterns that have been analyzed. Given these findings, it is imperative that effective therapies be adapted to address the unique constraints inherent to a particular population. Altering the environment, acquiring knowledge, and obtaining psychological assistance exemplify the multifaceted approaches that can be employed to achieve this objective. Considering the extensive array of challenges inherent in the various subgroups, it is highly improbable that a universal diabetes prevention strategy would successfully mitigate the disease across all demographics. Preliminary investigations reveal significant inconsistencies in essential knowledge areas, notably a pronounced lack of comprehension regarding prediabetes, a critical phase for possible intervention. Furthermore, our research reveals that diverse attitudes, such as preventive self-efficacy and fatalistic viewpoints, play a crucial role in mediating the shift from receiving information to initiating action. Exploratory investigations have delineated three essential categories of obstacles: constraints pertaining to resources, psychological impediments, and systemic limitations.

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