Utilization Behavior and Influencing Factors of Integrated Medical-Preventive Services among Diabetic Patients in Shandong Province: Post-print

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Abstract

Background: With the development of economy and society, the prevalence of diabetes continues to rise year by year. Patients with diabetes require not only treatment services, but also comprehensive and continuous integrated medical-preventive care services. However, due to the separation of "medical treatment and prevention"and other reasons, there are certain deficiencies in the utilization of integrated medical-preventive care services among diabetic patients. Therefore, improving the utilization of integrated medical-preventive care services for diabetic patients is of paramount importance.

Objective: To understand the current status of integrated medical-preventive care service utilization behaviors and their influencing factors among diabetic patients in Shandong Province, and to provide references for further improving policies and practices related to integrated medical-preventive care.

Methods: In August 2023, using a multistage stratified cluster random sampling method, and based on geographical location and economic development status, Yantai, Weifang, and Liaocheng were selected from the eastern, central, and western regions of Shandong Province, respectively. One county/county-level city was selected from each prefecture-level city as the sample area. In each county/city, 4 townships were randomly selected, and in each township, 2 villages were randomly selected. In each village, 25 diabetic patients managed under the basic public health services were randomly selected for a questionnaire survey. Multifactorial binary Logistic regression analysis was used to explore the influencing factors of integrated medical-preventive care service utilization behaviors among diabetic patients.

Results: A total of 602 patients were surveyed, and 600 valid questionnaires were ultimately collected, with an effective response rate of 99.67%. The rate of favorable integrated medical-preventive care service utilization behaviors among diabetic patients was 54.5% (327/600). Statistically significant differences were observed in the utilization of integrated medical-preventive care services among diabetic patients with different education levels, living situations, awareness of integrated medical-preventive care, health beliefs, family doctor contract signing status, comorbidity with other chronic diseases, and self-rated health status ($P<0.05$). The results of multifactorial binary Logistic regression analysis showed that diabetic patients with junior high school education (OR=1.896), good awareness of integrated medical-preventive care (OR=5.818), good health beliefs (OR=2.701), and contracted family doctor services (OR=2.106) had better integrated medical-preventive care service utilization behaviors ($P<0.05$).

Conclusion: At the current stage, there remains considerable room for improvement in integrated medical-preventive care service utilization behaviors among diabetic patients in Shandong Province. Efforts should continue to improve integrated medical-preventive care services, enhance the quality of family doctor services, and increase publicity and education regarding integrated medical-preventive care and related policies.

Full Text

Investigation of Utilization Behaviors and Influential Factors in the Integration of Medical and Preventive Care for Diabetic Patients in Shandong Province

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Abstract

Background: With the development of the economy and society, the prevalence of diabetes has been increasing year by year. Diabetic patients require not only treatment services but also comprehensive and continuous integration of medical and preventive care. However, due to the fragmentation of "medical-preventive" services, there are certain deficiencies in the utilization of integration of medical and preventive care for diabetic patients. Therefore, improving the utilization of these services is crucial. **Objective:** To understand the current status and influencing factors of the utilization of integration of medical and preventive care among diabetic patients in Shandong Province, and to provide references for further improving related policies and practices. **Methods:** In August 2023, a multi-stage stratified cluster random sampling method was used. Based on geographical location and economic development status, Yantai City, Weifang City, and Liaocheng City were selected from the eastern, central, and western regions of Shandong Province, respectively. One county/county-level city was chosen from each city as the sample area. Then, four townships were randomly selected from each county/city. Two villages were randomly selected from each township, and 25 diabetic patients managed by basic public health services were randomly selected from each village to conduct a questionnaire survey. Multivariate binary logistic regression analysis was used to explore the influencing factors of the utilization behavior. **Results:** A total of 602 patients were surveyed, and 600 valid questionnaires were collected, with a validity rate of 99.67%. The good utilization rate of integration of medical and preventive care among diabetic patients was 54.5% (327/600). There were statistically significant differences in the utilization of these services among patients with different education levels, living conditions, awareness of integration of medical and preventive care, health beliefs, family doctor contracting status, presence of other chronic diseases, and self-rated health status ($P<0.05$). Multivariate binary logistic regression analysis showed that patients with junior high school education (OR=1.896), good awareness of integration of medical and preventive care (OR=5.818), good health beliefs (OR=2.701), and those who had contracted a family doctor (OR=2.106) had better utilization behavior integration of medical and preventive care ($P<0.05$). **Conclusion:** At present, there is still significant room for improvement in the utilization of integration of medical and preventive care among diabetic patients in Shandong Province. Efforts should be made to further improve these services, improving the quality of family doctor services, and increase the publicity of integration of medical and preventive care and related policies.

Key words: Diabetes mellitus; Integration of medical and preventive care; Utilization of health services; Cross-sectional studies; Shandong

Introduction

With economic and social development, lifestyle changes, and deepening population aging, the prevalence of diabetes has been rising continuously, making it the world' s third major chronic disease after cardiovascular diseases and tumors. Research shows that in 2021, the number of people with diabetes aged 20-79 in China was approximately 141 million [1], and this is projected to increase to 147.2 million by 2045 [2]. Diabetic patients require not only treatment services but also comprehensive and continuous integrated medical and preventive care, including health screening, diagnosis, treatment, and rehabilitation. The integration of medical and preventive care combines clinical diagnosis and treatment with disease prevention-oriented public health services to provide residents with integrated services. Studies both domestically and internationally have shown that providing patients with full-cycle, comprehensive, seamless, and continuous integrated medical and preventive services helps prevent disease occurrence, promote recovery, or delay disease progression [3].

Currently, theoretical research and practical work on the integration of medical and preventive care remain in the exploratory and developmental stages, with certain difficulties in implementation [4]. Previous research on chronic disease integration has primarily focused on the supply side, such as model exploration and indicator construction [5]. In contrast, fewer studies have examined the demand side, mainly investigating impact and effectiveness, and preference measurement [6]. Understanding patients' health service utilization is key to promoting and improving the integration of medical and preventive care. This study aims to analyze the utilization behaviors of integrated medical and preventive services among diabetic patients and their influencing factors, and to propose recommendations for optimizing these services and strategies for improving their utilization, thereby providing a theoretical reference for advancing related research and practical work.

Methods

Study Setting and Design This cross-sectional survey was conducted in Shandong Province in August 2023. Shandong is China' s second most populous province and third largest economy, with serious aging issues, high chronic disease burden, and substantial resident demand for integrated medical and preventive care services. A multi-stage stratified cluster random sampling method was employed. Based on geographical location and economic development status, we selected Yantai City (eastern region), Weifang City (central region), and Liaocheng City (western region). From each city, one county/county-level city was chosen as the sample area. Then, according to geographical location and economic development level (better and worse), four townships were randomly selected from each county/city. Two villages were randomly selected from each township, and 25 diabetic patients managed by basic public health services were

randomly selected from each village. Participants were contacted by phone and invited to the village clinic for questionnaire administration. A total of 602 patients were surveyed. After excluding two invalid questionnaires with missing or erroneous responses, 600 valid questionnaires were retained, yielding a validity rate of 99.67%. This study complied with the regulations of the Ethics Committee of the School of Public Health at Shandong University and obtained ethical approval (LL20221120). All participants provided written informed consent.

Study Participants The study included diabetic patients managed by basic public health services. Inclusion criteria were: (1) diagnosed with diabetes according to diagnostic criteria; (2) age >18 years; (3) clear consciousness and ability to communicate normally; and (4) voluntary participation with signed informed consent. Exclusion criteria were: (1) patients with mental illness or unclear consciousness; and (2) patients unable to communicate normally due to hearing or language impairments.

Survey Instruments A self-designed questionnaire was used, consisting of two main parts. (1) **Personal characteristics of diabetic patients**: This section was designed according to Andersen' s model, including predisposing characteristics, enabling resources, and need factors. Predisposing characteristics included demographics (gender, age), social structure (marital status, education level, occupation, living arrangement), and diabetes patients' awareness and health beliefs regarding integrated care. Awareness of integrated care was measured using a self-designed 10-item scale (score range: 10-50), with higher scores indicating better awareness; 70% of the maximum score was used as the cutoff for good awareness. Health beliefs were measured using the Diabetic Patient Health Belief Scale [7], comprising 20 items (score range: 20-100), with higher scores indicating stronger health beliefs; 70% of the maximum score was used as the cutoff for good health beliefs. Enabling resources included financial factors (medical insurance type, annual family income) and organizational factors (travel time to medical institutions, family doctor contract status). Need factors included perceived need (comprehensive self-rated health status) and evaluated need (presence of diabetes complications and other chronic diseases). (2) **Utilization behavior of integrated medical and preventive care**: Based on the *Chinese Clinical Guidelines for the Prevention and Treatment of Type 2 Diabetes in the Elderly (2022 Edition)* [8], *National Handbook for Primary Diabetes Prevention and Management (2022)* [9], and *National Basic Public Health Service Standards (Third Edition)* [10], we developed a 12-item scale assessing utilization behavior from the demand perspective, covering prevention, treatment, and management services. Each item used a 5-point Likert scale from "strongly disagree" to "strongly agree" (scored 1-5). Scores <4 on individual items indicated poor utilization, while $ $4 indicated good utilization. A total scale score <48 indicated poor overall utilization behavior, while $ $48 indicated good utilization behavior. The scale demonstrated good reliability and validity (Cronbach' s α=0.830, KMO=0.846).

Data Collection and Quality Control Before fieldwork, investigators received centralized training to understand the study' s significance, objectives, and specific indicator definitions, as well as to standardize questionnaire administration and data recording procedures. A pilot study with 20 participants was conducted to assess questionnaire clarity, participant cooperation, and completion time. During formal data collection, strict adherence to inclusion and exclusion criteria was maintained. Researchers remained neutral and did not influence participants' responses. Data entry staff were trained centrally, and a database was established using Epidata 3.0. Double data entry was performed, and check files were used to identify outliers and logical errors. Any discrepancies were verified against original questionnaires.

Statistical Analysis SPSS 17.0 software was used for statistical analysis. Categorical data were expressed as relative frequencies. Univariate analysis was performed using chi-square tests. Multivariate binary logistic regression analysis was conducted to explore influencing factors of integrated medical and preventive care utilization behavior, with $P<0.05$ considered statistically significant.

Results

Basic Characteristics of Respondents Among the 600 diabetic patients, 404 (67.3%) were female; 375 (62.5%) were aged 60-74 years; 505 (84.2%) were married; 210 (35.0%) had primary school education; 521 (86.8%) were non-farmers; 384 (64.0%) lived with a spouse; 320 (53.3%) had good awareness of integrated care; 485 (80.8%) had good health beliefs; 563 (93.8%) had urban-rural resident medical insurance; 389 (64.8%) had annual family income <10,000 RMB; 561 (93.5%) required <15 minutes to reach medical institutions; 411 (68.5%) had contracted a family doctor; 487 (81.2%) had no diabetes complications; 492 (82.0%) had other chronic diseases; and 412 (68.7%) rated their health as unhealthy. Additional details are shown in Table 1 .

Utilization Behavior and Item Scores The good utilization rate of integrated medical and preventive care services was 54.5% (327/600). Results showed that only 48.5% of diabetic patients actively asked doctors about behavioral risk factors and complication risks during treatment, and only 33.7% proactively learned diabetes-related health knowledge during treatment. Details are presented in Table 2 .

Univariate Analysis of Utilization Behavior Statistically significant differences in integrated care utilization were found among patients with different education levels, living situations, awareness of integrated care, health beliefs, family doctor contract status, presence of other chronic diseases, and self-rated health status ($P<0.05$). See Table 3 .

Multivariate Binary Logistic Regression Analysis Using integrated care utilization behavior as the dependent variable (poor=0, good=1) and personal characteristics, awareness, health beliefs, travel time, family doctor contract, diabetes complications, other chronic diseases, and self-rated health as independent variables (see Table 4 for assignments), multivariate binary logistic regression analysis revealed that diabetic patients with junior high school education had better utilization behavior than illiterate patients [OR (95%CI)=1.896 (1.048-3.430)]. Patients with good awareness of integrated care had better utilization than those with poor awareness [OR (95%CI)=5.818 (3.797-8.914)]. Patients with good health beliefs had better utilization than those with poor health beliefs [OR (95%CI)=2.701 (1.591-4.588)]. Patients with annual family income of 10,000-30,000 RMB had worse utilization than those with income <10,000 RMB [OR (95%CI)=0.431 (0.249-0.747)]. Patients who had contracted a family doctor had better utilization than those without [OR (95%CI)=2.106 (1.338-3.314)]. See Table 5 .

Discussion

Significant Room for Improvement in Utilization Behavior Our findings indicate considerable room for improvement in the utilization of integrated medical and preventive care among diabetic patients in Shandong Province. During diabetes prevention and treatment, patients demonstrated good performance in receiving medical assessment, treatment, and health follow-up, indicating high compliance with medical staff and active service-seeking behavior. This also reflects healthcare providers' strong willingness to deliver integrated services following policy implementation [11]. However, patients showed deficiencies in proactively asking about disease risk factors and complications and in actively learning diabetes-related health knowledge. This suggests that diabetic patients currently lack understanding of integrated care, and their health awareness and literacy need improvement. Therefore, health education should be tailored to patients' conditions and education levels through appropriate and diversified formats [12] to enhance health literacy, prevention awareness, and understanding of integrated services.

Influence of Education Level and Awareness on Service Utilization Higher education levels were associated with better utilization of integrated services. This may be because higher education correlates with better health literacy, greater understanding of national health policies, and increased likelihood of actively learning about basic public health service programs [13] and participating in integrated care. Patients with good awareness of integrated care demonstrated better utilization behavior. Based on the Knowledge-Attitude-Practice theory, health knowledge can transform into health consciousness [14], thereby promoting health-related behaviors and increasing integrated service utilization. Patients with strong health beliefs also showed better utilization, likely

because they have better treatment compliance, evaluate treatment outcomes more positively, and take proactive actions to improve treatment effectiveness [15].

Influence of Income Level and Family Doctor Contract on Service Utilization Paradoxically, patients with higher income levels showed worse utilization behavior compared to low-income patients. This may be because high-income groups have better financial security and health status, resulting in lower demand for health services. Additionally, insufficient current publicity about integrated care may limit their awareness of these services. Patients who had contracted a family doctor demonstrated better utilization than those without, as family doctors are the primary providers of integrated services. The family doctor contract system enables residents to deeply understand the role of family doctors as health gatekeepers, enhances trust in family doctors [16], and facilitates better utilization of integrated services.

Influence of Comorbidities and Self-Rated Health on Service Utilization The presence of other chronic diseases and self-rated health status both affected service utilization. Patients with multiple chronic conditions have higher perceived disease severity and more actively seek health services with greater compliance to medical advice [17], resulting in better utilization. Compared with patients with good self-rated health, those with poor self-rated health showed better integrated care utilization. Previous research indicates that poorer self-rated health correlates with greater medical service needs and higher utilization [18]. Patients with poor self-rated health, constrained by long-term chronic disease impacts on daily life and work, pay more attention to health changes and rely more on healthcare providers due to limited medical knowledge [19], thus demonstrating better utilization.

Recommendations This study reveals significant room for improving integrated medical and preventive care utilization among diabetic patients in Shandong Province. Education level, living situation, awareness of integrated care, health beliefs, annual family income, family doctor contract status, and self-rated health are key influencing factors. Therefore, we recommend: (1) strengthening the connection between public health and medical services and improving inter-institutional collaboration to enhance integrated care; (2) leveraging the central role of family doctors and implementing the family doctor contract system effectively; (3) innovating publicity methods to increase policy awareness and motivate service utilization [20]; (4) paying special attention to patients living alone, those with multiple chronic conditions, and those with poor self-rated health by intensifying health education and promotion activities, enriching community health service content, and organizing collective health promotion activities [21] to improve health beliefs and health status, thereby increasing satisfaction with integrated services.

Study Strengths and Limitations This study' s innovation lies in its comprehensive examination of diabetic patients' health service utilization behavior and influencing factors from the perspective of integrated medical and preventive care, providing theoretical references for better meeting health service needs and improving quality of life. However, the study has limitations. The proportion of female participants was higher than male, which may overestimate service utilization in the overall population. Additionally, as a cross-sectional study, it cannot demonstrate temporal changes or establish causal relationships, potentially affecting result accuracy. Future research should incorporate temporal dimensions to track changes in diabetic patients' integrated care utilization behavior, enhancing the accuracy and scientific rigor of findings.

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Author Contributions: FAN Wenyu conceptualized the study, designed the research, implemented the investigation, and wrote the manuscript. FENG Xia and MA Xingli collected and organized data, performed statistical analysis, and prepared tables and figures. ZHANG Shilong and ZHANG Xindan revised the manuscript. ZHAO Yang and WANG Haipeng were responsible for quality control and review, and provided overall supervision.

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