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Diabetic patients' behaviors and influential factors of using medical and preventative integrated services in Shandong Province: A questionnaire survey

Wenyu Fan[a,b], Xia Feng[a,b], Xingli Ma[a,b], Shilong Zhang[a,b], Xindan Zhang[a,b], Yang Zhao[c,d,*], Haipeng Wang[a,b,*]

[a] Centre for Health Management and Policy Research, School of Public Health, Cheeloo College of Medicine, Shandong University,Shandong Jinan, China
[b] NHC Key Lab of Health Economics and Policy Research (Shandong University), Shandong Jinan, China
[c] The George Institute for Global Health, University of New South Wales, Sydney, Australia
[d] Melbourne School of Population & Global Health, The University of Melbourne, Melbourne, Australia

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ABSTRACT

Background: Diabetic patients require continuous medical and preventative integrated services. However, due to the separation between "medical care" and "prevention," the use of integrated medical-preventive services for diabetes patients remains inadequate.
Objective: To investigate diabetic patients' behaviors and influential factors of using medical and preventative integrated services in Shandong Province, and to inform further improvement of related policies and practices.
Methods: A multi-stage stratified random sampling method was used to conduct a questionnaire survey of 600 diabetic patients in Shandong Province. Binary logistic regression model was employed to analyze the influential factors of using medical and preventative integrated services of diabetic patients in Shandong Province.
Results: The participants reported 54.5 % of diabetic patients had better use of using medical and preventative integrated services. Diabetic patients with junior high school education(OR = 1.896), good cognition of medical and preventative integrated services (OR = 5.818), good health beliefs (OR = 2.701), and contracted a family doctor (OR = 2.106) had better use of medical and preventative integrated services ($P < 0.05$).
Conclusion: Currently, there remains significant room for improvement in using medical and preventative integrated services for diabetic patients in Shandong Province, and it is necessary to continue enhancing medical and preventative integrated services, promoting the family doctor contracting program, and increase the publicity of higher sores of using medical and preventative integrated services and related policies.

With the development of the economy and society, changes in lifestyle, and the deepening of population aging, the prevalence of diabetes has been continuously increasing year by year, becoming third most prevalent chronic disease in the world after cardiovascular diseases and cancer. Relevant studies indicate that in 2021, there were approximately 141 million diabetic patients aged 20–79 in China,[1] and this number is expected to increase to 147.2 million by 2045.[2] Diabetic patients not only require treatment services but also comprehensive, continuous medical and preventative integrated services, including screening, diagnosis, treatment, and rehabilitation. Medical and preventative integrated services refer to the integration of clinical diagnosis and treatment services with preventive services focusing on disease prevention within medical institutions, providing patients with comprehensive medical and preventive care. Curative and preventative services have been separated for decades in China as the two fragmented parts by different authoritative administrations, different education and training, as well as different provision systems. It has been shown that providing patients with full-cycle, all-around, seamless, and continuous medical and preventative integrated services helps in preventing disease occurrence, promoting disease improvement, or delaying disease progression.[3] Currently, the theoretical research and practical work of medical and preventative integrated services are still in the exploratory and development stages, with certain difficulties in the implementation and development of related work.[4]

Previous research on medical and preventative integrated services for chronic diseases has mainly focused on the supply side, such as model

* Corresponding authors.
E-mail addresses: Wzhao@georgeinstitute.org.cn (Y. Zhao), wanghaipeng@sdu.edu.cn (H. Wang).

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exploration and indicator construction.[5] In contrast, research on the demand side is relatively limited, primarily addressing the impact and effectiveness, preference measurement.[6] Understanding patients' utilization of health services is crucial for advancing and improving medical and preventative integrated services.[4] The utilization of medical and preventative integrated services of diabetic patients refers to the actual utilization of the integrated services provided by the health system for diabetic patients. This include the comprehensive, continuous use of preventive care (health screening, complication screening), treatment services (health assessment and treatment, referral services), and health management services (health education, follow-up). This article aimed to analyze diabetic patients' behaviors and influential factors of using medical and preventative integrated services provided by health system, and propose suggestions for optimizing medical and preventative integrated services and strategies to improve their using behaviors.

Research subjects and methods

Research setting and design

This study was conducted in August 2023 in Shandong Province, the second most populous and third most economically developed province in China. Shandong Province faces significant population aging and high demand for health services. A multi-stage stratified random sampling method was used in this study. 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. In each city, one county or county-level city was chosen as a sample area. Further, stratification based on geographical location and economic development levels (better and worse), led to the selection of four townships from each county/city, and two villages were selected from each township. From each village, 25 diabetic patients managed under basic public health services were chosen and notified by phone to come to the village clinic for a questionnaire survey. Ultimately, 602 patients were surveyed, with 2 invalid questionnaires excluded due to missing or erroneous data or missing key variables, resulting in 600 valid questionnaires collected.

Research subjects

This study targeted diabetic patients managed under basic preventive services. The inclusion criteria were as follows: (1)met the diagnostic criteria for diabetes and were diagnosed with diabetes; (2)aged > 18 years; (3)clear consciousness and able to communicate normally; (4)voluntary participation in the survey and provision of informed consent.

The exclusion criteria were: (1) patients with mental illness or unclear consciousness; (2) patients who could not communicate normally with the investigators due to hearing or speech impairments; (3) patients who were uncooperative, refused the survey, or withdrew during the survey.

Data collection and quality control

Prior to the field survey, all interviewers received centralized and standardized training to ensure the understanding of the study's significance, objectives, and the specific meanings of each indicator. The training also covered uniform methods for questionnaire administration and data recording. Prior to the formal survey, 20 sample cases were selected for a preliminary survey to evaluate the ease of questionnaire completion, the level of cooperation from patients, and the time required to complete the questionnaire. During the formal survey, strict adherence to the inclusion and exclusion criteria for research subjects was maintained. Throughout data collection, interviewers remained neutral and non-judgmental toward the responses of the survey subjects, avoiding any interference or influence on their genuine answers. Data entry personnel also received centralized and standardized training. Epidata 3.0 was used to establish a database for the diabetic patients' using behaviors of medical and preventative integrated services. Data were entered twice to ensure accuracy, and check files were used to detect any outliers or logical errors. If data errors were found, they were cross-checked and corrected using the original questionnaires. During data analysis, statistical methods were strictly followed to ensure the accuracy of the analysis.

Ethical approval

This study was conducted in accordance with the regulations of the Ethics Committee of the School of Public Health at Shandong University and obtained ethical approval (LL20221120). Patients willing to participate in the survey signed an informed consent form on site.

Survey tools

This study utilized a self-developed questionnaire, which was mainly divided into the following four parts:

(1) Characteristics of diabetic patients:

This part was designed according to the Andersen model, including predisposing characteristics, enabling resources, and needs. Predisposing characteristics included demographics (gender, age), social structure (marital status, education level, occupation, living pattern, etc.), and diabetic patients' cognition and health beliefs regarding medical and preventative integrated services.

The cognition of medical and preventative integrated services was measured using a self-designed cognition scale for diabetic patients, comprising 10 items with a score range of 10–50. Higher scores indicated a better cognition regarding medical and preventative integrated services.

A threshold of 70 % was used to evaluate the patients' cognition. Health beliefs were measured using the Health Belief Scale for Diabetic Patients,[7] which included 20 items with a score range of 20–100. Higher scores indicated stronger health beliefs, with 70 % used as the threshold.

Enabling resources included financial resources (medical insurance coverage, annual household income) and organizational resources (travel time to medical institutions, whether they had signed a family doctor contract).

Demands included perceived needs (comprehensive self-assessed health status) and evaluated needs (presence of diabetes complications or other chronic diseases).

(2) Diabetic patients' behaviors of using medical and preventative integrated services:

Based on the specific content and requirements of diabetes prevention, treatment, and management as outlined in "Clinical guidelines for prevention and treatment of type 2 diabetes mellitus in the elderly in China (2022 edition)," "National handbook for the prevention and control of diabetes in primary care (2022)," and "National Basic Public Health Service Specifications (Third Edition)," a scale was designed to measure the diabetic patients' behaviors of using medical and preventative integrated services. This scale combines the continuity and integration of the utilization in prevention, treatment, and management from the demand-side perspective. The scale consists of 12 items, each rated on a 5-point Likert scale ranging from "strongly disagree" to "strongly agree," scoring from 1 to 5 points, respectively. Scores of <4 on individual items indicate poor utilization, while scores of 4 or higher indicate good utilization. A total scale score of <48 points signifies poor use of medical and preventative integrated services, while a total score of 48 or higher signifies good utilization. The Cronbach's alpha coefficient of the scale is 0.830, and the KMO value is 0.846, indicating good reliability and validity.

Statistical methods

SPSS 17.0 software was used for statistical analysis. Descriptive analysis was conducted on the sociodemographic characteristics of all participants using frequencies and composition ratios. Chi-square tests were used for univariate analysis to compare whether differences in the use of medical and preventative integrated services of diabetic patients with different characteristics were statistically significant. Binary logistic regression was employed to analyze influential factors of using medical and preventative integrated services of diabetic patients. A P-value of <0.05 was considered statistically significant.

Results

General information

Among the 600 diabetic patients surveyed, 404 were female (67.3 %), and 375 were aged 60–74 (62.5 %). The majority were married (505, 84.2 %), and 210 had primary school education (35 %). Most participants were non-farmers (521, 86.8 %) and lived with their spouse (384, 64.0 %). Regarding medical and preventative integrated services, 320 patients (53.3 %) had a good cognition, while 485 (80.8 %) had good health beliefs. A large proportion (563, 93.8 %) were covered by urban-rural resident medical insurance, and 389 had an annual household income of <10,000 Chinese Yuan (CNY) (64.8 %). Most patients (561, 93.5 %) could reach a medical institution within 15 min, and 411 (68.5 %) contracted with a family doctor. In terms of health conditions, 487 patients (81.2 %) had no diabetes complications, 492 (82.0 %) had other chronic diseases, and 412 (68.7 %) self-rated their health status as poor. These findings are summarized in Table 1.

Diabetic patients' using behavior of medical and preventative integrated services and scores for each item

Overall, 54.5 % of diabetic patients demonstrated better use of medical and preventative integrated services. The specific item scores are as follows: 69.7 % of patients identified as high-risk for diabetes during health screenings managed to control their blood glucose by adjusting their lifestyle; 60.5 % of patients suspected of having diabetes during health screenings went to medical institutions for further examinations and diagnosis; 83.5 % of patients diagnosed with diabetes, received evaluation and treatment from doctors at medical institutions; 48.5 % of diabetic patients actively inquired about disease risk factors and the possibility of complications during treatment; 56.5 % of diabetic patients actively sought lifestyle guidance from doctors during treatment; 92.7 % of diabetic patients received follow-up management (such as blood glucose monitoring and physical examinations) from doctors during their routine diabetes treatment; 57.7 % of patients went to medical institutions for complication screening when their blood glucose remained unstable or other abnormal symptoms appeared during routine diabetes treatment; 72.3 % of patients chose to go to medical institutions for treatment when they had diabetes complications; 74.5 % of patients opted for referral to higher-level medical institutions when their diabetes condition worsened. 58.0 % of patients, after treatment for diabetes at higher-level hospitals, returned to primary care facilities for subsequent treatment and management once their condition stabilized. 76.5 % of patients regularly monitored their blood glucose after

Table 1
Basic information of the respondents.

Variable	Subgroups	Frequency	Percentage (%)
Propensity characteristics			
Gender	Male	196	32.7
	Female	404	67.3
Age	<60 years old	74	12.3
	60–74 years old	375	62.5
	≥75 years old	151	25.2
Marital status	Married	505	84.2
	Other	95	15.8
Education level	Illiterate	189	31.5
	Elementary school	210	35.0
	Middle school	161	26.8
	High school and above	40	6.7
Occupation	Farming	79	13.2
	Non-farming	521	86.8
Living pattern	Living alone	82	13.7
	Living with spouse	384	64.0
	Living with spouse and other family members	134	22.3
Cognition of medical and preventative integrated services	Poor	280	46.7
	Good	320	53.3
Health beliefs of diabetic patients	Poor	115	19.1
	Good	485	80.8
Enabling resource			
Type of medical insurance	Basic medical insurance for urban workers	37	6.1
	Medical insurance for urban and rural residents	563	93.8
Annual household income	<10,000 CNY	389	64.8
	10,000 to 30,000 CNY	136	22.7
	≥ 30,000 CNY	75	12.5
Travel time to medical institutions	<15 min	561	93.5
	≥15 min	39	6.5
Family doctor contract	No	189	31.5
	Yes	411	68.5
Needing factors			
Complications of diabetes	Yes	113	18.8
	No	487	81.2
Complications of other chronic diseases	Yes	492	82.0
	No	108	18.0
Self-assessed health status	Unhealthy	412	68.7
	Healthy	188	31.3

Table 2
Diabetic patients' using behaviors of medical and preventative integrated services and the basic situation of each item.

Diabetic patients' using behaviors of medical and preventative integrated services and items	Poor		Good	
	n	%	n	%
Use of medical and preventative integrated services	273	45.5	327	54.5
When you are found to be at high risk of diabetes during health screening, you can control your blood glucose through lifestyle modification (proper diet, moderate exercise, etc.).	182	30.3	418	69.7
If you are suspected of having diabetes during health screening, you can go to a medical institution to undergo relevant tests to confirm your diagnosis.	237	39.5	363	60.5
When you are diagnosed with diabetes, you will be evaluated and treated by a doctor at a medical institution.	99	16.5	501	83.5
Ask your doctor about risk factors for disease behavior and the possibility of complications during treatment.	309	51.5	291	48.5
You are able to seek lifestyle guidance from your health care provider during your treatment.	261	43.5	339	56.5
In the course of daily treatment of diabetes mellitus, they have received follow-up management (e.g., blood glucose monitoring, physical examination, etc.) by medical personnel.	44	7.3	556	92.7
If your blood glucose control is unstable for a long period of time or you have other abnormal symptoms during your daily diabetes treatment, you can go to a medical institution for screening of complications.	254	42.3	346	57.7
If you suffer from diabetes complications, you can choose to go to a medical institution for treatment of the complications.	166	27.7	434	72.3
If your diabetes condition worsens, you can choose to be referred to a higher level hospital.	153	25.5	447	74.5
If your diabetes is stabilized at a higher level of care, you will be referred back to a primary care facility for follow-up care and management.	252	42.0	348	58.0
Regular blood glucose monitoring when you are referred back to the primary care facility.	141	23.5	459	76.5
In the course of your diabetes treatment, you take the initiative to learn about diabetes-related health knowledge.	398	66.3	202	33.7

being transferred back to primary care facilities. 33.7 % of patients actively learned about health knowledge related to diabetes during their treatment. These findings are summarized in Table 2.

Univariate analysis of diabetic patients' behaviors of using medical and preventative integrated services

There were statistically significant differences ($P < 0.05$) in using medical and preventative integrated services of diabetic patients with different education levels, living patterns, cognition of medical and preventative integrated services, health beliefs, family doctor contract status, presence of other chronic diseases, and self-assessed health status. These findings are summarized in Table 3.

Binary logistic regression analysis of diabetic patients' behaviors of using medical and preventative integrated services

A binary logistic regression analysis was conducted with medical and preventative integrated services as the dependent variable (assignment: poor = 0, good = 1). The independent variables included personal basic characteristics, cognition of medical and preventative integrated services, health beliefs of diabetic patients, travel time to medical institution, family doctor contract status, presence of diabetes complications, presence of other chronic diseases, and self-assessed health status. The results showed that diabetic patients with junior high school education had better using behavior than illiterate patients [OR (95 % CI) = 1.896 (1.048–3.430)]; patients with good cognition of medical and preventative integrated services had better using behavior than those with poor cognition [OR (95 % CI) = 5.818 (3.797–8.914)]; patients with good health beliefs had better use of medical and preventative integrated services than those with poor health beliefs [OR (95 % CI) = 2.701 (1.591–4.588)]; patients with annual household income of 10,000 to 30,000 CNY had worse using behavior than those with annual household income below 10,000 CNY [OR (95 % CI) = 0.431 (0.249–0.747)]; patients who contracted a family doctor had better using behavior than those who had not contracted a family doctor [OR (95 % CI) = 2.106 (1.338–3.314)]. These findings are summarized in Table 4.

Discussion

Significant room for improvement in the diabetic patients' behaviors of using medical and preventative integrated services

The study found considerable room for improvement in diabetic patients' behaviors of using medical and preventative integrated services. In the prevention and treatment of diabetes, patients performed well in receiving evaluations and treatments from medical professionals, as well as in health follow-ups, indicating a high level of compliance with medical professionals and positive attitude in seeking medical care of patients. Additionally, with the implementation of policies on medical and preventative integrated services, medical professionals are highly willing to provide medical and preventative integrated services, resulting in higher service quality.[8] However, the study also revealed that diabetic patients still lag in actively inquiring about disease risk factors, complications, and actively learning health knowledge related to diabetes, indicating poor cognition of medical and preventative integrated services and improvement need for health conscious and literacy. Therefore, it is essential to provide patients with appropriate and diverse health education based on their condition and education level,[9] thereby enhancing patients' health literacy and preventive awareness, and improving their recognition and use of medical and preventative integrated services.

Table 3
Univariate analysis of diabetic patients' using behaviors of medical and preventative integrated services.

Variable	Subgroups	Poor(<48)		Good(≥48)		χ^2 value	P value
		n	%	n	%		
Propensity characteristics							
Gender	Male	75	38.27	121	61.73	0.320	0.571
	Female	145	35.89	259	64.11		
Age	<60 years old	23	31.08	51	68.92	1.609	0.447
	60–74 years old	137	36.53	238	63.47		
	≥75 years old	60	39.74	91	60.26		
Marital status	Married	182	36.04	323	63.96	0.540	0.462
	Other	38	40.00	57	60.00		
Education level	Illiterate	83	43.92	106	56.08	10.804	0.013
	Elementary school	80	38.10	130	61.90		
	Middle school	44	27.33	117	72.67		
	High school and above	13	32.50	27	67.50		
Occupation	Farming	27	34.18	52	65.82	0.242	0.622
	Non-farming	193	37.04	328	62.96		
Living pattern	Living alone	35	42.68	47	57.32	16.895	<0.001
	Living with spouse	156	40.62	228	59.38		
	Living with spouse and other family members	29	21.64	105	78.36		
Cognition of medical and preventative integrated services	Poor	150	58.59	106	41.41	92.446	<0.001
	Good	70	20.35	274	79.65		
Health beliefs of diabetic patients	Poor	77	66.96	38	33.04	56.208	<0.001
	Good	143	29.48	342	70.52		
Enabling resource							
Type of medical insurance	Basic medical insurance for urban workers	10	22.86	27	77.14	3.103	0.078
	Medical insurance for urban and rural residents	212	37.66	351	62.34		
Annual household income	<10,000 CNY	135	34.70	254	65.30	4.255	0.119
	10,000 to 30,000 CNY	60	44.12	76	55.88		
	≥ 30,000 CNY	25	33.33	50	66.67		
Travel time to medical institutions	<15 min	204	36.36	357	63.64	0.341	0.559
	≥15 min	16	41.03	23	58.97		
Family doctor contract	No	100	52.91	89	47.09	31.348	<0.001
	Yes	120	29.20	291	70.80		
Needing factors							
Complications of diabetes	Yes	37	32.74	76	67.26	0.922	0.337
	No	183	37.58	304	62.42		
Complications of other chronic diseases	Yes	170	34.55	322	65.45	5.259	0.022
	No	50	46.30	58	53.70		
Self-assessed health status	Unhealthy	148	35.92	264	64.08	14.775	<0.001
	Healthy	72	38.30	116	61.70		

Education level and cognition of medical and preventative integrated services influence the using behaviors of diabetic patients

Diabetic patients with higher education levels are more inclined to use medical and preventative integrated services. This may be due to the correlation between higher education levels and higher health literacy, better cognition of national health policies, and a greater likelihood of proactively seeking basic public health service programs.[10] Patients with good cognition of medical and preventative integrated services also exhibit better use behavior. Based on the Knowledge-Attitude-Practice (KAP) model, health knowledge can be transformed into health conscious, thereby promoting health-related behaviors and enhancing the use of medical and preventative integrated services.[11] Patients with good health beliefs also demonstrate better use of medical and preventative integrated services. This could be because patients with better health beliefs are more compliant with treatment and have a higher evaluation of treatment effectiveness. Consequently, they are more likely to take proactive actions to improve treatment outcomes,[12] thereby increasing their use behavior of medical and preventative integrated services.

Income level and family doctor contracts influence diabetic patients' using behaviors of medical and preventative integrated services

Compared to low-income diabetic patients, those with higher income levels exhibit poorer use of medical and preventative integrated services. This may be due to higher-income groups having better economic security and health status, resulting in less demand for health services. Additionally, the current insufficient promotion of medical and preventative integrated services leads to a lack of cognition among high-income individuals, resulting in under use of these services. Diabetic patients contracted with a family doctor show better use of medical and preventative

Table 4
Binary logistic regression analysis of diabetic patients' using behaviors of medical and preventative integrated services.

Variable	OR	95 %CI	SE	P
Propensity characteristics				
Gender(male as reference)				
Female	1.433	0.896–2.291	0.343	0.133
Age(<60 years old as reference)				
60–74 years old	1.087	0.531–2.222	0.396	0.819
≥75 years old	1.081	0.479–2.439	0.448	0.850
Marital status(married as reference)				
Other	0.754	0.238–2.385	0.443	0.632
Education level(Illiterate as reference)				
Elementary school	0.968	0.584–1.603	0.249	0.900
Middle school	1.896	1.048–3.430	0.573	0.034
High school and above	1.096	0.431–2.788	0.522	0.846
Occupation(farming as reference)				
Non-farming	1.537	0.727–3.249	0.586	0.259
Living pattern(living alone as reference)				
Living with spouse	1.058	0.317–3.529	0.650	0.927
Living with spouse and other family members	2.697	0.830–8.759	1.621	0.099
Cognition of medical and preventative integrated services(poor as reference)				
Good	5.818	3.797–8.914	1.266	<0.001
Health beliefs of diabetic patients(poor as reference)				
Good	2.701	1.591–4.588	0.730	<0.001
Enabling resource				
Type of medical insurance(basic medical insurance for urban workers as reference)				
Medical insurance for urban and rural residents	0.290	0.082–1.019	0.186	0.054
Annual household income(<10,000 CNY as reference)				
10,000 to 30,000 CNY	0.431	0.249–0.747	0.120	0.003
≥ 30,000 CNY	0.712	0.309–1.638	0.302	0.425
Travel time to medical institutions(<15 min as reference)				
≥15 min	0.820	0.371–1.810	0.331	0.624
Family doctor contract(no as reference)				
Yes	2.106	1.338–3.314	0.487	<0.001
Needing factors				
Complications of diabetes(yes as reference)				
No	1.183	0.703–1.992	0.314	0.526
Complications of other chronic diseases(yes as reference)				
No	1.373	0.816–2.308	0.363	0.231
Self-assessed health status(unhealthy as reference)				
Healthy	0.793	0.501–1.254	0.185	0.322

integrated services compared to those who have not. Family doctors are the primary providers of medical and preventative integrated services. Family doctors contracted services allow patients to deeply understand the function and role of family doctors as gatekeepers of their health, enhancing their trust in family doctors. This increased trust enables better use of medical and preventative integrated services.[13]

Influence of comorbid chronic diseases and self-assessed health status on diabetic patients' using behaviors of medical and preventative integrated services

The study demonstrates that the presence of comorbid chronic diseases and self-assessed health status significantly impact diabetic patients' using behaviors of medical and preventative integrated services. Patients with multiple chronic diseases have a higher perceived their condition and are more proactive in seeking health services, displaying higher compliance with medical care,[14] resulting in better use of variable health care. Compared to diabetic patients with good self-assessed health status, those who perceive their health as poor are more likely to use medical and preventative integrated services. Research indicates that individuals with negative self-assessment of their health status have greater medical service needs and higher using rate.[15] These patients are often more attentive to changes in their health due to the long-term limitations imposed by chronic diseases on their daily activities. Their reliance on medical professionals increases because they lack comprehensive medical knowledge,[16] prompting them to actively seek integrated care.

Conclusion

In summary, there is still significant room for improvement in diabetic patients' using behaviors of medical and preventative integrated services. Factors influencing the using behavior include education level, living pattern, cognition of medical and preventative integrated services, health beliefs, annual household income, family doctor contracts, and self-assessed health status. Therefore, it is essential to promote the integration of preventive and medical services, enhance inter-institutional collaboration, and improve medical and preventative integrated services. The role of family doctors in medical and preventative integrated services should be emphasized, and the family doctor contract system should be implemented. Innovative promotional methods should be employed to enhance policy cognition and increase patients' motivation to utilize the services.[17] Special attention should be given to patients living alone, those with multiple chronic diseases, and those with poor self-assessed health, by intensifying health knowledge promotion, enhancing health conscious, and improving self-care abilities to prevent chronic diseases and improve quality of life, thereby increasing their satisfaction with medical and preventative integrated services. Health education and promotion activities should also be strengthened for pre-diabetic patients, enriching the content of community health services, and organizing group health promotion activities to improve health beliefs and self-assessed health status.[18]

As the number of diabetic patients continues to rise, they are increasingly becoming the group in need of focused attention. However, previous studies on diabetic patients' using behaviors of medical and

preventative integrated services are limited, typically concentrating on either medical or preventive health services. This study's innovation lies in comprehensively exploring diabetic patients' behaviors and influential factors of health service using behavior from the perspective of medical and preventative integrated services alone, providing theoretical references for better meeting their health service needs and improving quality of life. The study's limitation is that the sample had a higher proportion of females than males, which might overestimate the overall population's service using behaviors. Additionally, as a cross-sectional study, it cannot show changes over time or establish causality, which may affect the accuracy of the results. The participants were selected instead of recruited through an informed consent and voluntary process. The approach is used for easy administrating the survey, however, may introduce bias due to enforce answer question and less chance refuse the survey. Future studies should include a temporal dimension to track changes in diabetic patients' using behaviors of medical and preventative integrated services, thereby enhancing the accuracy and scientific validity of the findings.

Declarations

Not applicable.

Authors' contributions

Conceptualization, F.W.; Methodology, F.W.; Data curation, F.X. and M.X.; Formal analysis, F.X. and M.X.; Funding acquisition, not applicable; Project administration, not applicable; Resources, not applicable; Supervision, Z.Y. and W.H.; Validation, Z.Y. and W.H.; Writing—original draft, F.W.; Writing—review and editing, Z.Y. and W.H. All authors have read and agreed to the published version of the manuscript.

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Declaration of competing interest

The authors declare that they have no competing interests.

Availability of data and materials

Not applicable.

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