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Research on Prevention and Treatment of Elderly Type 2 Diabetes Based on the Combination of Medical And Nursing Care Mode

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Abstract: Objective: *This study aims to analyze the current status of elderly care services and medical assistance for the elderly, and to delve into the actual medical service needs of the elderly under the combined medical and nursing care mode. Furthermore, it investigates whether this mode helps reduce the incidence of complications in patients with type 2 diabetes mellitus (T2DM) and whether it can effectively improve key health indicators (such as fasting blood glucose, triglyceride, glycated hemoglobin, and urine microalbumin levels) among elderly diabetic patients, thereby enhancing their quality of life. Additionally, this study explores the differences in satisfaction among T2DM patients at the end-of-life stage under the combined medical and nursing care mode, constructs relevant mode and questionnaires, lays a foundation for the clinical application and management of chronic diseases in the elderly, and promotes the development of prevention and treatment efforts for chronic diseases in the elderly in China.*

Methods: *The study initially established a control group and an prevation group, measured and compared baseline indicators between the two groups, and analyzed the correlation between fasting blood glucose, triglyceride, glycated hemoglobin, microalbuminuria, and factors such as age and weight. Subsequently, treatment interventions were administered to both groups separately in three hospitals. After routine treatment, a t-test was employed to compare treatment outcomes between the control and prevation group by gender, and the correlation between the aforementioned indicators and age, weight was re-measured and analyzed. Finally, differences in measurement indicators were compared within the control group and between the control and prevation group at two time points.*

Results:*The research findings demonstrate that the combination of medical nursing care mode excels in optimizing fasting blood glucose management among type 2 diabetes patients. Specifically, this mode significantly reduced patients' fasting blood glucose levels, glycated hemoglobin concentrations, triglyceride levels, and urinary microalbumin content. After six months of treatment, both the mean and median of the baseline data showed a decline, indicating the remarkable efficacy of the combination of medical nursing care mode in controlling fasting blood glucose among type 2 diabetes patients. The specific data are as follows: fasting blood glucose (mean = 7.826±0.135), glycated hemoglobin concentration (mean=6.480±0.789), triglycerides (mean=1.553±0.066), and urinary microalbumin (mean=12.869±0.426), all of which were lower than the control group and significantly different from the initial baseline measurements. Over the six-month treatment period, the Mann-Whitney U test revealed more pronounced reductions in the mean and median of baseline data in the intervention group compared to the control group. From the index value of the prevation group of body weight, fasting blood glucose, triglyceride, glycosylated hemoglobin and urinary microalbumin, and there were significant differences in the conventional treatment effect of each hospital. Specifically, the intervention group showed greater mean differences in fasting blood glucose (1.867±0.277), glycated hemoglobin concentration (1.782*

±0.164), and triglycerides (0.761±0.094) compared to the control group. Furthermore, a statistically significant difference was observed in fasting blood glucose between the two groups. According to data of the first measurement of the two groups, There was a positive correlation between glycosylated hemoglobin and Fasting blood glucose（r=0.224，p=0.001）in the control group. According to data, there was a positive correlation between glycosylated hemoglobin and weight（r=0.228，p=0.001）in the prevation group. There was also a positive correlation between urinary microalbumin and fasting blood glucose（r=0.193，p=0.002）in the prevation group.

Conclusion: *In conclusion, the comprehensive combination of medical nursing care mode has demonstrated significant therapeutic effects in reducing fasting blood glucose, glycated hemoglobin, triglycerides, and urinary microalbumin levels in patients with type 2 diabetes.*

1 Backgroud

According to globally recognized benchmarks, a nation (or region) attains the status of an aging society when seniors aged 60 and above comprise over 10% of the total population, or when those aged 65 and above exceed 7%. Worldwide, the phenomenon of population aging is intensifying. As per the "World Population Prospects: The 2019 Revision," the proportion of individuals aged 65 and above stands at 9% currently and is anticipated to surge to 16% by 2050 (UN, 2019).According to the WHO, the number of diabetes patients aged 20-79 globally surged by 35.67% from 1998 to 2003, hitting 194 million. This number is anticipated to climb to 333 million by 2025, with a substantially faster growth rate in developing countries than in developed ones. Most of the new cases will be concentrated in developing regions such as China, the Indochinese subcontinent, and Africa (King et al., 1998). The prevalence of diabetes has emerged as a formidable challenge for social and public health, particularly for ethnic minorities and underdeveloped areas in both developing and developed nations.At present, diabetes is the sixth leading cause of death in developed nations (WHO, 2004).

Type 2 diabetes mellitus (T2DM) is a chronic hyperglycemic metabolic disease caused by insulin resistance accompanied by the decline of pancreatic β-cell function (Chinese Diabetes Society, 2018). According to the International Diabetes Federation (IDF) statistics, the number of diabetic patients globally has approached 425 million in 2017, with a prevalence rate of 10.4% in the Chinese population, making China the country with the largest number of diabetic patients worldwide. As the global population ages at an accelerated pace, the medical burden is becoming increasingly heavy, with global diabetes-related medical expenditures reaching USD 727 billion, accounting for approximately 12% of all medical expenditures (Cho et al., 2018). Furthermore, T2DM can lead to a series of complications that, if left uncontrolled for an extended period, will significantly impact patients' health-related quality of life and increase their mortality rates. Despite the availability of various effective antidiabetic drugs, a cure for T2DM remains elusive. Precision health management integrates multiple disciplines such as genetics, traditional Chinese and Western medicine, nutrition, computer science, etc. into health management. With the help of gene sequencing combined with big data analysis, it can help identify individual differences, guide personalized interventions, and achieve fine-grained management, thereby improving the efficiency of disease screening, prevention, and treatment, reducing the burden on medical care, and safeguarding the quality of life of patients (Collins, 2015).Patients with T2DM generally have low levels of self-management, and family members can provide the greatest emotional support. Studies have found that incorporating family education into health management can better supervise patients' medication, diet, exercise, and monitoring, making up for the limitations of clinical treatment and nursing (Patel, 2008). Similarly, other scholars have discovered that after receiving eight sessions of family health education per week, patients showed significant improvements in blood glucose, blood pressure, self-efficacy, and quality of life (United Nations, Department of Economic and Social Affairs, Population Division, 2019).

2 research object and method

This study focused on 520 patients aged over 60 with type 2 diabetes from three hospitals in Xi'an, Shaanxi

Province, China. During the initial phase of the study, baseline measurements were conducted for both the control and prevation group to compare the primary indicators between the two groups. Further analysis was performed to examine the differences in fasting blood glucose, triglycerides, glycated hemoglobin, and microalbuminuria between the control and prevation group, with consideration for age and weight variations. Analysis of variance was used to assess differences in treatment outcomes between the control and prevation group across the three hospitals. Following routine treatment, the t-test was employed to compare treatment outcomes between genders within both groups, and correlations were re-measured between groups to delve into the associations between fasting blood glucose, triglycerides, glycated hemoglobin, microalbuminuria, and age, weight. The secondary indicators of the control group were compared with the primary indicators.as well as two indicators between the control group and the prevation group.

In this study, we recruited 520 elderly patients (all over 60 years old) with type 2 diabetes from three hospitals in Xi'an, Shaanxi Province, China, with 260 patients in each of the experimental and control groups. Patients in the prevation group underwent real-time medical monitoring of ecological and physiological indicators, while those in the control group did not receive any form of monitoring. All subjects underwent health education, telephone interviews, personal interviews, and follow-ups. Both the control and prevation group underwent initial measurements.Subsequently, we conducted a review and follow-up survey of all subjects. The data collected from the two surveys were processed and analyzed using EpiData 3.1 and SPSS 26 statistical software to verify their acceptability and reliability.

We compared the first indicators between the control and prevation group and analyzed the trends of fasting blood glucose, triglycerides, glycated hemoglobin, and microalbuminuria with age and weight at the initial measurement in both groups. Through analysis of variance, we compared the treatment effects between the control and prevation group across the three hospitals. After routine treatment, we compared the treatment effects between different genders within the control and prevation group and re-measured the correlations between the two groups, aiming to delve deeper into the associations between fasting blood glucose, triglycerides, glycated hemoglobin, microalbuminuria, and age, weight. Finally, we used the t-test to compare the second and first indicators within the control group and between the control and prevation group.

3 Result

3.1 The baseline and post 6 months follow up for the control and intervention group

From the data, we can see the fasting blood glucose, glycated hemoglobin， triglyceride and urinary microalbumin are all decrease significantly of the the control and intervention group. After the intervention group applied combination of medical and nursing care mode, the index of the fasting blood glucose, glycosylated hemoglobin, triglyceride and urinary microalbumin of patients decreased more obviously. The specific data are as follows: fasting blood glucose (mean = 7.826±2.176), glycated hemoglobin concentration (mean = 6.480±1.272), triglycerides (mean = 1.553 ±1.065), and urinary microalbumin (mean = 12.869±6.868), all of which were lower than the control group.

Table 1 The statistics of the baseline data of independent variable during 6 months follow up

variable	control group (N=260)					intervention group (N=260)				
	minimum	Maximum	Mean	Median	standard deviation	Minimum	maximum	mean	Median	standard deviation
age	60	86	71.220	71.00	5.768	60	90	70.070	70.00	5.763
weight	46	112	68.712	68.00	10.409	45	141	68.585	70.00	9.202

Table 2 The statistics of the baseline data of dependent variable during 6 months follow up

variable	control group (N=260)					intervention group (N=260)				
	minimum	Maximum	Mean	Median	standard deviation	Minimum	maximum	mean	Median	standard deviation

fasting blood glucose	1.00	39.280	8.835	7.500	3.663	2.000	19.560	7.826	7.500	2.176
glycosylated hemoglobin	2.500	14.600	7.540	7.000	1.974	0.900	9.500	6.480	6.400	1.272
triglyceride	0.570	5.160	1.899	1.620	0.823	0.550	11.040	1.553	1.560	1.065
urinary microalbumin	11.000	45.400	24.868	22.300	5.840	0.300	33.500	12.869	12.300	6.868

3.2 Comparison of therapeutic effect in three hospitals

3.2.1 Comparison of the control group in each hospital after routine treatment

Independent-Samples Kruskal-Wallis Test was applied on the control group to compare the treatment effect of each hospital. It was found that there were significant differences in the conventional treatment effect of each hospital of fasting blood glucose, triglyceride, and glycosylated hemoglobin.

Table 3 Comparison of the treatment effect of the control group

variable	hospital 1 (N=133)		hospital 2 (N=83)		hospital 3 (N=44)		Test	Sig.
	Mean	Median	Mean	Median	Mean	Median		
fasting blood glucose	10.003± 0.367	8.900	7.502± 0.254	7.100	7.821± 0.298	7.070	Kruskal-Wallis Test	0.000
triglyceride	2.112± 0.799	1.87	1.696± 0.072	1.560	1.641± 0.090	1.620	Kruskal-Wallis Test	0.000
glycosylated hemoglobin	8.257± 0.174	8.300	6.300± 0.145	6.100	7.714± 0.267	7.800	Kruskal-Wallis Test	0.000
urinary microalbumin	24.108±0.445	22.400	26.406±0.7192	22.600	24.264±0.902	22.000	Kruskal-Wallis Test	0.360

Asymptotic significances are displayed. The significance level is .05

3.2.2 Comparison of the prevation group in Each Hospital after Routine Treatment

Independent-Samples Kruskal-Wallis Test was used to compare measurements of the first index of comparison of the treatment effect of the prevation group.
Independent-Samples Kruskal-Wallis Test was applied on the prevation group to investigate the treatment effect of each hospital. From the index value of the prevation group of body weight, fasting blood glucose, triglyceride, glycosylated hemoglobin and urinary microalbumin, and there were significant differences in the conventional treatment effect of each hospital.

Table 4 Comparison of the treatment effect of the prevation group

variable	hospital 1 (N=67)		hospital 2 (N=177)		hospital 3 (N=16)		Test	Sig.
	Mean	Median	Mean	Median	Mean	Median		
Body weight	65.820± 1.408	63.000	69.590± 0.605	70.000	69.000± 2.111	69.500	Kruskal-Wallis Test	0.000
fasting blood glucose	8.989± 0.370	8.230	7.416± 0.124	7.300	7.496± 0.287	7.250	Kruskal-Wallis Test	0.000

triglyceride	2.191±0.207	1.560	1.317±0.427	1.300	1.496±0.203	1.530	Kruskal-Wallis Test	0.000
glycosylated hemoglobin	7.367±0.177	7.100	6.095±0.078	6.100	7.019±0.181	6.800	Kruskal-Wallis Test	0.000
urinary microalbumin	14.131±0.951	12.400	12.399±0.483	12.200	12.781±1.822	11.700	Kruskal-Wallis Test	0.025

Asymptotic significances are displayed. The significance level is .05

3. 3 The measurement of the second index

The control group was given routine treatment without combination of medical and nursing care mode; The prevation group was given combination of medical and nursing care mode. After half a year, Mann-Whitney U test was used to compare the second index measurement between the control group and the prevation group. The results are shown in the table below.

Table 5 The measurement of the second index

variable	control group (N=260)		prevation group (N=260)		Test	Sig.
	Mean	Median	Mean	Median		
fasting blood glucose	8. 835±0.227	7.500	7.826±0.135	7.500	Mann-Whitney U Test	0.033
triglyceride	1.899±0.051	1.620	1.553±0. 066	1.560	Mann-Whitney U Test	0.000
glycosylated hemoglobin	7.540±0.122	7.000	6.480±0.789	6.400	Mann-Whitney U Test	0.000
urinary microalbumin	24.868±0.362	22.300	12.869±0.426	12.300	Mann-Whitney U Test	0.000

The significance level is .05

3.4 Correlation analysis of the second index measurement in the control group and prevation group

3.4.1 Correlation analysis of the second index measurement in the control group

The control group analyzed the correlation between fasting blood glucose, triglyceride, glycosylated hemoglobin, urinary microalbumin and age and body weight.

According to data of the first measurement of control group , there was a weakly correlation between body weight and urinary microlbumin（r=-0,153，p=0.013）in the control group. There was also a weakly correlation between fasting blood glucose and triglyceride（r=0.159，p=0.010）in the control group. There was a positive correlation between glycosylated hemoglobin and Fasting blood glucose（r=0.224，p=0.001）in the control group.

Table 6 Correlation analysis of the second index measurement in the control group

Variable (Spearman's rho)		Age	weight	fasting blood glucose	triglyceride	glycosylated hemoglobin	urinary microalbumin
Age (year)	Correlation Coefficient	1	0.034	-0.010	0.086	0.033	-0.008
	significance		0.586	0.869	0.165	0.650	0.617

**	significance (double tailed)						
	N	260	260	260	260	260	260
Weiht (kg)	Correlation Coefficient	0.034	1.000	-0.011	-0.029	-0.091	0.153*
	significance (double tailed)	0.586		0.860	0.641	0.145	0.013
	N	260	260	260	260	260	260
fasting blood glucose(mmol/L)	Correlation Coefficient	-0.010	-0.011	1.000	0.159*	**0.224****	0.071
	significance (double tailed)	0.869	0.860		0.010	0.000	0.254
	N	260	260	260	260	260	260
triglyceride (mmol/L)	Correlation Coefficient	0.086	-0.029	0.159*	1.000	0.005	-0.051
	significance (double tailed)	0.165	0.641	0.010		0.931	0.412
	N	260	260	260	260	260	260
glycosylated hemoglobin(%)	Correlation Coefficient	-0.028	-.091	0.224**	0.005	1.000	-0.002
	significance (double tailed)	0.650	0.145	0.000	0.931		0.969
	N	260	260	260	260	260	260
urinary microalbumin (mg/L)	Correlation Coefficient	-0.031	-0.153*	0.071	-0.051	-0.002	1.000
	significance (double tailed)	0.617	0.013	0.254	0.412	0.969	
	N	260	260	260	260	260	260

When the confidence (double test) is 0.01, the correlation is significant.
* When the confidence (double test) is 0.05, the correlation is significant.

3.4.2 Correlation analysis of the second index measurement in the prevation group

The prevation group analyzed the correlation between fasting blood glucose, triglyceride, glycosylated hemoglobin, urinary microalbumin and age and body weight. According to data, there was a positive correlation between glycosylated hemoglobin and weight（r=0.228，p=0.001）in the prevation group. There was also a positive correlation between urinary microalbumin and fasting blood glucose（r=0.193，p=0.002）in the prevation group.

Table 7 Correlation analysis of the second index measurement in the prevation group

Variable (Spearman's rho)		Age	weight	fasting blood glucose	triglyceride	glycosylated hemoglobin	urinary microalbumin
Age (year)	Correlation Coefficient	1.000	0.026	-0.049	0.031	-0.034	-0.031
	significance (double tailed)		0.667	0.431	0.618	0.589	0.618
	N	260	260	260	260	260	260

Weiht (kg)	Correlation Coefficient	0.026	1.000	0.040	-0.067	**0.228****	-0.116
	significance (double tailed)	0.677		0.519	0.282	0.000	0.061
	N	260	260	260	260	260	260
fasting blood glucose(mmol/L)	Correlation Coefficient	-0.049	0.040	1.000	0.026	0.037	**0.193****
	significance (double tailed)	0.431	0.519		0.672	0.547	0.002
	N	260	260	260	260	260	260
triglyceride (mmol/L)	Correlation Coefficient	0.031	-0.067	0.026	1.000	0.099	-0.024
	significance (double tailed)	0.618	0.282	0.672		0.110	0.704
	N	260	260	260	260	260	260
glycosylated hemoglobin(%)	Correlation Coefficient	-0.034	-0.228**	0.037	0.099	1.000	-0.002
	significance (double tailed)	0.589	0.000	0.547	0.110		0.977
	N	260	260	260	260	260	260
urinary microalbumin (mg/L)	Correlation Coefficient	-0.031	-0.116	0193**	-0.024	-0.002	1.000
	significance (double tailed)	0.618	0.061	0.002	0.704	0.977	
	N	260	260	260	260	260	260

** When the confidence (double test) is 0.01, the correlation is significant.
* When the confidence (double test) is 0.05, the correlation is significant.

4 DIsussion

In May 1987, the World Health Organization (WHO) first introduced the concept of "healthy aging" at the World Health Assembly, and in 1990, at the World Assembly on Aging in Copenhagen, it was established as a global development strategy to address aging issues. As the trend of population aging continues to intensify, research on "healthy aging" has gradually deepened and expanded in recent years (Spijker & Maclnnes, 2013; Rechel et al., 2013; Gandjour, 2014; Wouterse, 2013; Bauman et al., 2016). This study aims to construct a comprehensive elderly health service system through the existing pension service system, which will cover various aspects such as health education, preventive health care, emergency rescue, rehabilitation care, daily care, and spiritual comfort. The goal of this system is to reduce key health indicators for elderly diabetic patients, including fasting blood glucose, triglycerides, glycated hemoglobin, and urine microalbumin, thereby improving their quality of life.

This study selected 520 elderly diabetic patients as research subjects, with 260 in the control group receiving conventional treatment and 260 in the intervention group receiving a comprehensive treatment plan that combines medical care with pension services. This study compares baseline data before treatment (i.e., the first baseline measurement) with that six months after treatment and statistically analyzes satisfaction with medical services, aiming to promote the sharing of medical information, optimize resource allocation, and provide strong support for the scientific management of health services.

4.1 Baseline Data for the Control Group and Intervention Group

This study was conducted in three hospitals in Shaanxi Province, namely Zhouzhi Hospital, Tangcheng Hospital, and Traditional Chinese Medicine Hospital. Among the 520 elderly patients with type 2 diabetes involved in the study, 260 were selected as the control group, and the other 260 (both male and female) served as the intervention group. All 520 elderly patients selected were diagnosed with type 2 diabetes, resulting in a significant increase in the overall average levels of fasting blood glucose, triglycerides, glycated hemoglobin, and urinary microalbumin, exceeding the normal reference range. The study results indicated that during treatment, close monitoring and control of key indicators such as fasting blood glucose, triglycerides, glycated hemoglobin, and urinary microalbumin were necessary. For diabetic patients with a long duration of disease, advanced age, multiple cardiovascular risk factors, or established cardiovascular disease, strict glycemic control can effectively reduce the risk of deterioration of early diabetic microvascular complications (such as non-proliferative retinopathy, microalbuminuria, etc.) (Nathean et al., 2005; Holman et al., 2008). Clinical studies have amply demonstrated that in type 2 diabetic patients with cardiovascular disease, a comprehensive triglyceride-modulating strategy should be adopted to reduce the risk of cardiovascular events and mortality (Patel et al.).

4.2 Baseline Data and Follow-up After Six Months for the Control and Intervention Groups

After six months of routine treatment, the weight, fasting blood glucose (FBG), triglycerides (TG), glycated hemoglobin (HbA1c), and urinary microalbumin (U-MA) levels of patients in both the control and prevation group were reassessed. The data revealed significant reductions in FBG, TG, HbA1c, and U-MA in both groups.It is noteworthy that after implementing the combination of medical nursing care mode in the intervention group, there was a significant decrease in key indicators such as fasting blood glucose, triglycerides, glycated hemoglobin, and urinary microalbumin among patients.

The integration of the combination of medical nursing care mode has brought more pronounced therapeutic effects to patients through coordinated and comprehensive nursing services. This approach not only potentially helps to reduce fasting blood glucose and triglyceride levels but also affects glycated hemoglobin and urinary microalbumin levels through multiple pathways. Specifically, on the one hand, it enhances medication management: the close collaboration between medical and nursing teams ensures precise implementation of medication protocols, avoiding medication errors and effectively regulating blood glucose and triglyceride levels. On the other hand, it promotes lifestyle changes: nursing efforts focus on educating and supporting patients, guiding them to adjust their dietary habits, increase physical activity, and learn stress management. These changes have a positive impact on blood glucose control and triglyceride reduction.

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