ORIGINAL RESEARCH

Exploration of Holistic Nursing Strategy for Diabetic Patients with Pulmonary Tuberculosis

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ABSTRACT

Objective • To explore the application effect of comprehensive nursing based on medical-care integration in diabetic patients with pulmonary tuberculosis.

Methods • 80 diabetic patients with pulmonary tuberculosis who were treated at Affiliated Hospital of Hebei University from March 2022 to March 2023 were randomly divided into the routine nursing group and the comprehensive nursing group. The routine nursing group received conventional nursing care, while the comprehensive nursing group received comprehensive nursing based on medical-care integration and routine care. The blood glucose levels, tuberculosis cure rate, negative emotions, quality of life, and satisfaction with nursing care were compared before and after nursing in both groups.

Results • After receiving comprehensive nursing care, participants had lower fasting blood glucose, 2-hour postprandial blood glucose, and glycated hemoglobin levels than those who received routine nursing care. Compared to patients receiving standard care, patients under comprehensive care demonstrated increased rates of tuberculosis lesion resolution and tuberculosis bacilli conversion. The assessments of patients' negative emotions using SAS and SDS scores showed lower levels, while their scores for physiological, psychological, and social functions were higher. Additionally, they reported heightened levels of satisfaction with nursing care.

Conclusion • The provision of comprehensive nursing based on medical-care integration for patients suffering from diabetes complicated by pulmonary tuberculosis by medical and nursing personnel is advantageous for fostering amelioration in the clinical manifestations of individuals afflicted with this condition. Additionally, it facilitates patients' recuperation while significantly enhancing their emotional well-being, quality of life, and nursing satisfaction. (*Altern Ther Health Med.* [E-pub ahead of print.])

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INTRODUCTION

Diabetes Mellitus, an affliction of metabolic origin marked by the enduring state of elevated glucose in the bloodstream, bestows a substantial burden upon global welfare.[1] Tuberculosis, a contagious disease caused by Mycobacterium tuberculosis and transmitted through the air, poses significant challenges to public health.[2] According to statistical data, the concurrent prevalence of diabetes and tuberculosis exceeds one million individuals.[3] Findings have unveiled that the likelihood of developing tuberculosis triples among patients grappling with diabetes.[4] The coexistence of tuberculosis and diabetes may engender dire complications, even culminating in patient demise.[5]

Nursing, a pivotal aspect of the clinical management of patients with concurrent diabetes and tuberculosis, assumes a paramount role.[6] Providing proper and fitting nursing care is crucial for ameliorating symptoms and fostering patient recuperation within this population.[7] Doctors and nurses are responsible for delivering care to these patients.[8] Regrettably, The lack of efficient coordination in nursing care and the potential for suboptimal teamwork among healthcare providers are considerable challenges in the nursing process, significantly affecting the quality of patient treatment and care.[9,10]

Integrated care has been hailed as a global phenomenon within the healthcare sphere, as it facilitates seamless collaboration and the pursuit of shared professional values among healthcare providers in the hospital setting.[11]

Refinement: In contrast to traditional care, Holistic care is all-encompassing and tailored. It focuses on addressing the fundamental requirements of the individual while also tending to their psychological welfare.[12] Various manifestations of integrated care have consistently demonstrated efficacy across diverse nursing environments, patient demographics, languages, and cultures.[13] Research contends that implementing integrated care can effectively address the needs of individuals afflicted by both diseases.[14]

Consequently, this study explores the application and effectiveness of integrated care grounded in the assimilation of medical and nursing practices for individuals afflicted with diabetes and tuberculosis.

DATA AND METHODS

General Information of Patients

80 patients with concurrent diabetes and pulmonary tuberculosis who sought treatment at our Hospital from March 2022 to March 2023 were selected as the study participants. Using the random number method, the patients were divided into two groups: the routine care group of 40 patients and the comprehensive care group of 40 patients. As of the time the patient was admitted, Within the comprehensive care group, there were 25 males and 15 females, with an age range of 49-73 years (mean age: 58.65±5.08), pulmonary tuberculosis duration ranging from 1-6 years (mean duration: 2.98±1.40), and diabetes duration ranging from 1-12 years (mean duration: 6.73±2.31). In the routine care group, there were 22 males and 18 females, with an age range of 48-73 years (mean age: 58.33±5.06), pulmonary tuberculosis duration ranging from 1-5 years (mean duration: 2.90±1.28), and diabetes duration ranging from 1-12 years (mean duration: 6.55±2.42). After comparison, no statistically significant differences in baseline characteristics were found between the two groups ($P > .05$), indicating their comparability. The inclusion criteria for the study participants were: (1) The patient meets the diagnostic criteria for diabetes combined with pulmonary tuberculosis. (2) complete clinical diagnosis and treatment information; (3) patients and their families were informed of the study and signed the informed consent form. The exclusion criteria were as follows: (1) incomplete clinical medical records, (2) presence of cognitive or mental disorders, (3) presence of other organ diseases such as liver or kidney diseases, and (4) presence of malignant tumor diseases. This study underwent review and approval by the Medical Ethics Committee by the Helsinki Declaration.[15] All patients and their families were informed about the study and provided informed consent (Clinical approval number: 2141ZF318).

Methods

The routine care group received standard care, which encompassed offering solace to hospitalized patients, reminding them of daily treatment precautions and effective ways to control their diet, providing guidance on medication prescriptions, increasing their awareness of the harm caused by the disease and the precautions during treatment, correcting maladaptive behaviors in daily life, and impeding the progression of the disease.

The comprehensive care group received integrated care based on the fusion of medical and nursing expertise. This involved: (1) establishing a comprehensive care management team. The team comprised one head nurse, five responsible nurses, and two physicians. The team members deepened their understanding of diabetes and tuberculosis nursing and treatment-related knowledge and elucidated their responsibilities, with the head nurse responsible for arranging and overseeing nursing work and the physicians responsible for formulating treatment plans. The responsible nurses assisted the physicians in conducting comprehensive assessments of patient conditions and jointly developing diagnosis and treatment plans. (2) Collaborative ward rounds between physicians and nurses. Physicians and responsible nurses visited patients in the wards together. Physicians shared the patients' medical history, diagnosis, and treatment conditions, while responsible nurses reported on patients' health needs, nursing content, etc. They actively discussed medical orders, with the physician and nurses patiently addressing patients' inquiries. The physician provided final supplementary information and reflections after the ward rounds, and the nurses promptly executed the medical orders and coordinated related work arrangements. (3) Integrated dynamic management of medical and nursing care. Responsible nurses continuously monitored the patient's blood glucose levels and symptoms, providing timely feedback to the physicians for adjustments to the treatment plans. (4) Complication care. Responsible nurses heightened observation of patients' conditions and promptly reported any changes to the physicians, facilitating discussions and developing prevention measures for complications. (5) Health education. The physician initially elucidated disease-related professional knowledge and advised patients to maintain a positive attitude. Subsequently, the responsible nurse conducted education through health manuals, bedside video presentations, and other forms of communication, during which the nurse gauged the patients' psychological state and provided tailored emotional and mental support. (6) Continuous quality improvement. Monthly work summary meetings were organized to holistically analyze the challenges encountered during the implementation of integrated care, based on the integration of medical and nursing care, and to propose corresponding enhancement measures and the nursing period for both groups lasted 20 days.

Observational Indicators

Before and following patient care, it is essential to assess fasting blood glucose, levels of glycated hemoglobin, and 2-hour postprandial blood glucose. The procedure for testing is as follows: a venous blood sample should be obtained at 8 AM on a subsequent day to measure fasting blood glucose and glycated hemoglobin. A venous blood sample should also be collected 2 hours after lunch to measure blood

glucose levels. After patient care, CT imaging should be employed to evaluate the resolution of tuberculosis lesions. If there is a ≥50% reduction in size, it indicates that the patient's tuberculosis lesions have undergone resolution (Figure 1). Furthermore, sputum specimens should be collected after patient care to examine sputum tuberculosis culture. A negative result indicates the patient's transformation to a negative status of tuberculosis bacteria. Before and after patient care, it is vital to assess the patient's negative emotional states using the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS). Higher scores on these scales indicate a more severe negative emotional state in patients.

Evaluation of quality of life

Before and after patient care, the Short Form-36 (SF-36) health survey should be utilized to evaluate the quality of life in both groups. The assessment encompasses three dimensions: physical functioning, mental health, and social functioning. The evaluation of the patient's physical function encompasses their physiological function, physical capacity, overall state of health, and physical discomfort. The dimension of mental well-being comprises an assessment of vitality, emotional well-being, and mental capacity. The assessment of social function encompasses an evaluation of the patient's social and occupational status. Each dimension has a maximum score of 100 points, with higher scores reflecting a greater quality of life for the patients.

Nursing Satisfaction

A questionnaire designed specifically for this study should be employed to evaluate the self-management abilities of the two groups, including regular exercise, dietary control, and medication adherence. Each dimension can score a maximum of 20 points, with higher scores indicating better patient self-management abilities. Additionally, the survey method should be implemented to assess the satisfaction levels of both groups, categorized as satisfied (50-60 points), moderately satisfied (30-49 points), and dissatisfied (0-29 points).[16]

Statistical Methods

SPSS version 25.0 and GraphPad Prism version 9.0 were used for statistical analysis of the data. Continuous variables should be presented as mean (± standard deviation), and intergroup comparisons should be conducted using *t* tests. Categorical variables should be submitted as n (%), and intergroup comparisons should be performed using chi-square tests. Statistical significance is considered present when the significance level is below $P < .05$.

RESULTS

Comparison of patients' blood glucose indicators

Upon meticulous comparison, before the implementation of nursing care, there were no notable disparities in fasting blood glucose, postprandial 2-hour blood glucose, and glycated hemoglobin levels between the two groups ($P > .05$). After the administration of nursing care, both groups

Figure 1. The CT imaging results indicate that the absorption of the pulmonary tuberculosis lesion in the patient exceeds 50%, suggesting significant improvement in the absorption of the pulmonary tuberculosis lesion.

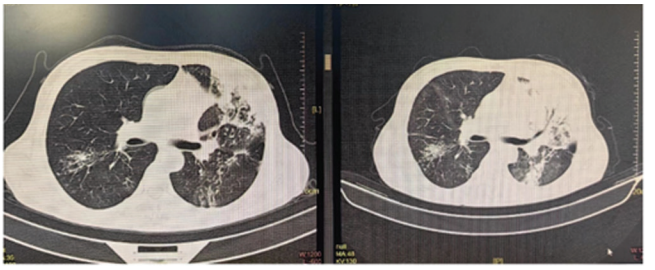


Table 1. Comparative analysis of patient's blood sugar levels

	Fasting blood glucose (mmol/L)		Postprandial 2-hour blood glucose (mmol/L)		Glycated hemoglobin levels (mmol/L)	
Collective	Before care	After care	Before care	After care	Before care	After care
Regular care group (n=40)	10.49±3.17	8.19±2.15[a]	13.79±4.55	9.43±2.81[a]	7.93±0.58	7.07±0.18[a]
Comprehensive care group (n=40)	10.53±3.70	6.22±2.41[a]	13.86±5.15	7.74±1.48[a]	7.99±0.42	5.95±0.24[a]
t	0.0519	3.8578	0.0644	3.3655	0.5299	23.6117
P value	.9587	<.05	.9488	<.05	.5977	<.05

Note: The data is presented as ($\bar{x} \pm s$), with a significant difference from pre-treatment conditions, with [a]$P < .05$.

Figure 2. After nursing, the levels of fasting blood glucose, postprandial 2-hour blood glucose, and glycosylated hemoglobin in both the comprehensive care group and the routine care group decreased compared to before nursing, and there was a statistically significant difference compared to before nursing.

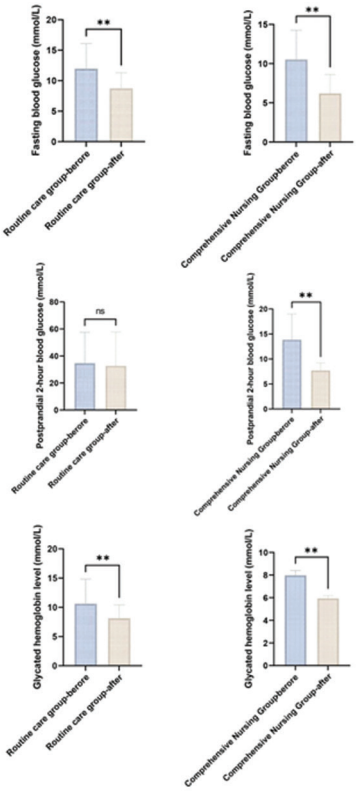
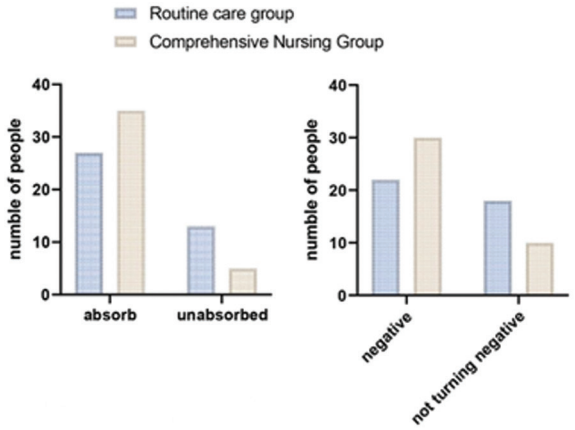


Table 2. The cure rate for tuberculosis patients is comparative.

Collective	Lesion uptake rate	sputum smear conversion rate for tuberculosis
Regular care group (n=40)	27 (67.5)	22 (55.0)
Comprehensive care group (n=40)	35 (87.5)	30 (75.0)
χ^2	4.5878	4.5283
P value	<.05	<.05

Note: The data is presented as ($\bar{x} \pm s$).

Figure 3. After nursing, the number of tuberculosis lesions absorbed in the comprehensive care group was more significant than in the routine care group, and the number of tuberculosis lesions not absorbed was fewer than in the routine care group. Examination of tuberculosis bacilli in the patient's sputum showed that the number of individuals with the negative conversion of tuberculosis bacilli in the comprehensive care group was more significant than in the routine care group, while the number of individuals with no negative conversion of tuberculosis bacilli was greater in the routine care group than in the comprehensive care group.



witnessed a decline in fasting blood glucose, postprandial 2-hour blood glucose, and glycated hemoglobin levels. Nonetheless, the comprehensive nursing group showcased significantly lower levels compared to the conventional nursing group ($P < .05$) (Table 1, Figure 2).

Comparison of patients' tuberculosis cure rates

Upon meticulous comparison, the conventional nursing group experienced a lower absorption rate of pulmonary tuberculosis lesions and a lower conversion rate of tuberculosis bacilli in comparison to the comprehensive nursing group (P <.05) (Table 2, Figure 3).

Comparison of patients' negative emotions

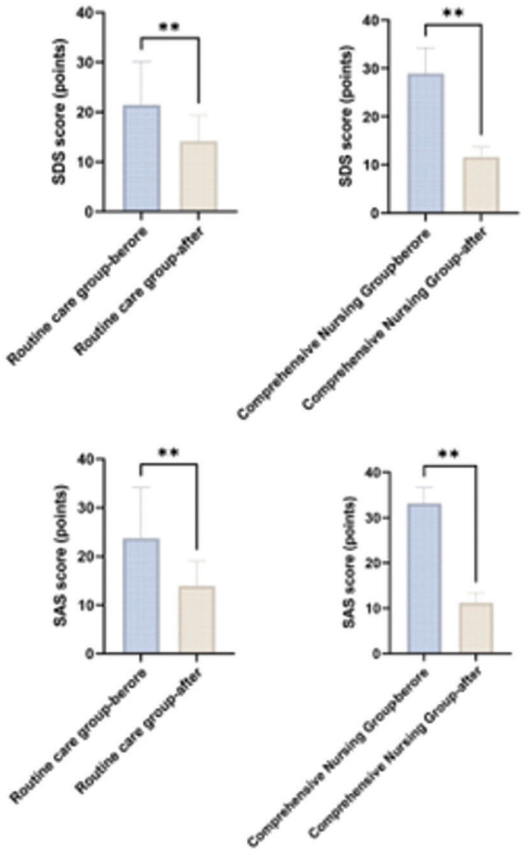
Upon meticulous comparison, before receiving nursing care, there were no substantial disparities in SAS and SDS scores between the two groups ($P > .05$). After providing nursing care, both groups demonstrated a reduction in SAS and SDS scores. However, the comprehensive nursing group exhibited significantly lower SAS scores and SDS scores compared to the conventional nursing group ($P < .05$) (Table 3, Figure 4).

Table 3. The patient's negative emotions are comparatively pronounced.

Collective	SDS score (scores)		SAS score (scores)	
	Before care	After care	Before care	After care
Regular care group (n=40)	28.52±4.51	18.47±2.25[a]	32.84±3.62	18.04±2.33[a]
Comprehensive care group (n=40)	28.96±5.34	11.65±2.13[a]	33.19±3.50	11.27±2.12[a]
t	0.3981	13.9217	0.4396	13.5922
P value	.6916	<.05	.6614	<.05

Note: The data is presented as ($\bar{x} \pm s$), with a significant difference from pre-treatment conditions, with [a]$P < .05$.

Figure 4. After nursing, both the SAS and SDS scores in the comprehensive care group and the routine care group decreased compared to before nursing, and there was a statistically significant difference between the post-nursing scores and the pre-nursing scores in both groups.



Comparison of patients' quality of life

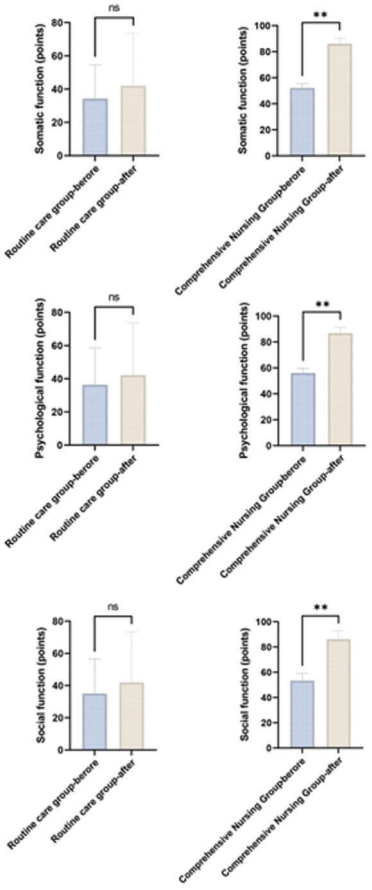
Upon meticulous comparison, before receiving nursing care, there were no significant differences in physical function, psychological function, and social function scores between the two groups ($P > .05$). After implementing nursing care, both groups experienced an enhancement in physical, psychological, and social function scores. However, the comprehensive nursing group achieved higher scores in all three dimensions compared to the conventional nursing group ($P < .05$) (Table 4, Figure 5).

Table 4. The comparison of patients' quality of life.

Collective	Physiological function (scores)		Psychological function (scores)		Social function (scores)	
	Before care	After care	Before care	After care	Before care	After care
Regular care group (n=40)	53.19±3.01	71.45±4.52[a]	57.08±3.25	71.76±4.32[a]	54.59±5.56	71.46±4.72[a]
Comprehensive care group (n=40)	52.28±3.17	86.16±4.29[a]	56.24±3.33	86.91±4.28[a]	53.48±5.72	86.33±6.45[a]
t	1.3166	14.9291	1.1417	15.7563	0.8801	11.7667
P value	.1918	<.05	.2571	<.05	.3815	<.05

Note: The data is presented as ($\bar{x} \pm s$), with a significant difference from pre-treatment conditions, with [a]$P < .05$.

Figure 5. Before nursing, there was no statistically significant difference in the scores of physical function, psychological function, and social function in the SF-36 scores between the comprehensive care group and the routine care group. After nursing, the scores of physical function, psychological function, and social function in the SF-36 scores of the comprehensive care group were higher than in the routine care group, and there was a statistically significant difference between the two groups.



Comparison of patients' satisfaction with nursing

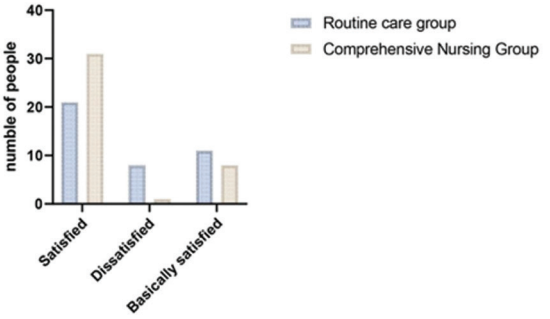
Upon meticulous comparison, satisfaction with nursing care was notably inferior in the conventional nursing group when juxtaposed with the comprehensive nursing group ($P < .05$) (Table 5, Figure 6).

Table 5. Comparative Analysis of Patient Satisfaction in Healthcare

Collective	Satisfied	Mostly Satisfied	Dissatisfied	Overall Satisfaction Level
Regular care group (n=40)	21 (52.5)	11 (27.5)	8 (20.0)	32 (80.0)
Comprehensive care group (n=40)	31 (77.5)	8 (20.0)	1 (2.5)	39 (97.5)
χ^2				4.5070
P value				.0338

Note: The data displays a value of n (%).

Figure 6. Most of the patients in both the comprehensive and routine care groups had a satisfactory attitude towards this study. Still, the number of patients with a satisfactory attitude towards this study in the comprehensive care group was more significant than in the routine care group. The number of patients with a dissatisfied attitude towards nursing was more significant in the routine care group than in the comprehensive care group.



DISCUSSION

A profound correlation exists between diabetes and tuberculosis.[17] Diabetic individuals face an augmented susceptibility to tuberculosis development and often endure suboptimal prognoses.[18] This phenomenon can be ascribed to the inherent and adaptive immune system impairment resulting from long-term inadequate glycemic control in diabetic patients.[19] Concurrently, tuberculosis can impede glucose tolerance and hinder blood sugar regulation in patients.[20] Furthermore, anti-tuberculosis medications can impede insulin metabolism, exacerbating disturbances in glucose and lipid metabolisms.[21] Moreover, elevated blood sugar levels in patients can lead to a significant increase in the number of lung cavities, wider spread of pulmonary lesions, and enlargement of cavities, thereby intensifying the severity of tuberculosis.[22] Consequently, patients with co-infection of diabetes and tuberculosis face an elevated risk of infection relapse, treatment failure, increased mortality rates, and delayed mycobacterial clearance.[23]

Nursing is pivotal in predicting patients' disease outcomes throughout the treatment process.[24] This investigation discovered that diabetic patients with concurrent tuberculosis who received integrated care based on collaboration between medical and nursing personnel exhibited significantly reduced fasting blood sugar, postprandial blood sugar, and glycated hemoglobin levels compared to those receiving routine care. The findings align

with the impact nursing care can have on patients' blood glucose levels.[25] Implicitly, integrated care based on collaboration between medical and nursing personnel significantly improves the glycemic status of patients with diabetes and tuberculosis. Optimal glycemic control is advantageous in the treatment of tuberculosis.[26] In this study, patients receiving integrated care based on collaboration between medical and nursing personnel demonstrated higher rates of tuberculosis lesion absorption and mycobacterium conversion. This signifies a noteworthy enhancement in tuberculosis recovery outcomes among patients with diabetes and tuberculosis who receive integrated care based on collaboration between medical and nursing personnel.

Apart from the direct physiological and pathological ramifications on patients, diabetes-complicating tuberculosis also increases the risk of negative emotions among patients.[27] This phenomenon can be attributed to inadequate social support, heightened sense of shame, substandard healthcare, and poor adherence to treatment.[28] Negative emotions among patients can impact their physical and mental well-being, thereby subsequently diminishing their quality of life and precipitating public health concerns.[29] Adequate nursing care exerts a positive effect on improving patients' negative emotions and quality of life.[30] In this study, patients who received integrated care based on collaboration between medical and nursing personnel exhibited a substantial improvement in negative emotions and quality of life. This suggests that integrated care based on collaboration between medical and nursing personnel can effectively alleviate negative emotions and enhance the quality of life among patients with diabetes and tuberculosis. Moreover, research has indicated that comprehensive care can effectively augment patients' satisfaction with nursing care.[31] These findings were corroborated in our study.

In conclusion, the implementation of integrated care based on collaboration between medical and nursing personnel for patients with diabetes and tuberculosis can effectively ameliorate glycemic control, foster tuberculosis recovery, mitigate negative emotions experienced by patients, enhance their quality of life, and elevate satisfaction with nursing care.

AUTHOR CONTRIBUTION

Yamin Zhao and Wei Yuan contributed equally to the work.

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