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Prevalence of Musculoskeletal Disorders and Associated Work-related Risk Factors in Chinese Physiotherapists: A Comparative Study

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ABSTRACT

Background: Due to the physical and work nature demands, physiotherapists (PTs) face a high risk of developing musculoskeletal disorders.
Objectives: To compare the prevalence and risk factors of work-related musculoskeletal disorders (WMSDs) between pediatric and adult PTs in China.
Materials and methods: A cross-sectional study was conducted between December 2023 to February 2024 among pediatric and adult PTs. It involved distributing a self-administered questionnaire to 129 PTs in three Chinese provinces, including five tertiary hospitals. This questionnaire collected demographic characteristics and data on the presence of musculoskeletal complaints within the last 12 months.
Results: Out of 192, there were 129 PTs responded to the questionnaire (67.18%). These include 62 pediatric PTs and 67 adult PTs group. The prevalence of WMSDs among the pediatric group was 53.9%, compared to 63.8% among the adult PTs group. However, significant differences in the body mass index and work experience were observed between the PTs groups (P-values = 0.019 and 0.018 respectively). Furthermore, no significant differences in demographic and associated factors, including workload, were found among PTs groups. Lower back was the most affected region in pediatric PTs (n = 46, 74.2%) and adult PTs (n = 44, 65.7%).
Conclusion: In China, PTs frequently experienced WMSDs, with the lower back being the primary affected region. This study provides valuable insights to inform the development of strategies aimed at reducing WMSDs among PTs, thereby improving their occupational health and safety. It explores unique challenges and differences in population conditions between pediatric and adult PTs.
Keywords: Work-related musculoskeletal disorders; Pediatric physiotherapist; Adult physiotherapist.

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INTRODUCTION

Work–related musculoskeletal disorders (WMSDs) refer to injuries or disorders affecting the musculoskeletal system that occur because of work-related activities [1]. These injuries arise due to factors such as challenging physical work, repetitive motions, and sustained exertion. Additionally, factors such as age, gender, and body mass index (BMI) contribute to an increased risk of musculoskeletal disorders (MSDs) [2–5]. Nonetheless, physiotherapists (PTs) consistently report a notable frequency of WMSDs [6]. As reported in a previous study, PTs have a lifetime prevalence of musculoskeletal pain ranging from $> 55\%$ to $< 91\%$ [7]. This high prevalence of musculoskeletal pain is a significant contributing factor to absences among PTs, leading to significant implications for productivity and economic outcomes. Similar to the findings by Nordin and Obembe, it is noteworthy that PTs themselves may also experience MSDs and require treatment [6, 8].

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Pediatric PTs may face unique challenges due to the nature of treating children, including frequent bending, lifting, and carrying patients [9], whereas adult PTs may encounter different demands related to the treatment of adult patients, such as managing chronic conditions or performing specialized rehabilitation techniques [10].

Understanding the prevalence and distribution of WMSDs in these specific populations is crucial for developing targeted prevention strategies and interventions. By identifying the most affected body regions and types of MSDs, tailoring ergonomic guidelines, and implementing training programs to minimize the risk of injuries and promote the well-being and longevity of PTs. A recent study reported that the prevalence of MSDs among Chinese healthcare professionals working in tertiary hospitals, while the 12-month prevalence rate of experiencing an MSD was 91.2% [9]. Fan et al., quantify and evaluate the ergonomic risk of clinical physiotherapy practices and evaluate PTs for WMSD and pain in China [8]. However, research focusing on the prevalence of WMSDs among pediatric and adult PTs in China, and moreover the potential differences between pediatric and adult PTs, is limited.

Hence, this study aims to address the existing research gap by offering valuable insights into the prevalence and distribution of WMSDs among Chinese PTs working with pediatric and adult patients. Additionally, it aims to compare the risk factors associated with WMSDs between pediatric and adult PTs.

MATERIALS AND METHODS

Participants

Three Chinese provinces, namely Hubei, Jiangsu, and Liaoning, were selected for this study. Five hospitals were randomly chosen from these provinces, including Tongji Affiliated Hospitals, Wuhan Union Hospital, Panjin Central Hospital, Xiangning Second Affiliated Hospital, and Nanjing Hospital. This is a cross-sectional study conducted between December 2023 and February 2024. All PTs with $\geq$ year of experience in the field of physical therapy were invited to participate in this study. The study excluded PTs with MSDs or a history of MSDs resulting from previous trauma. Furthermore, part-time PTs or those who had experienced traumatic injuries or serious medical conditions such as diabetes mellitus, rheumatoid arthritis, or tumor were also excluded. Out of the eligible participants, 129 PTs were divided into two groups: 62 pediatric PTs (pediatric PTs) and 67 adult PTs (including those specializing in neurology, cardiology, orthopedics, sports medicine, and geriatrics). These participants completed the questionnaire, while approximately 63 PTs failed to participate.

Data Collection

Before completing the questionnaire, all the participants were selected randomly and received a brief introduction explaining the research purpose, the procedures, and how the dataset would be used. The participants were required to answer all of the questions before submitting the survey, which confirmed no missing data. Participation was voluntary, and the respondents received no compensation for participating. In addition, data were collected about the WMSDs of the PTs.

Institutional Review Board Statement

The study was approved by the Ethics Committee of Affiliated Tongji Hospital of Huazhong University of Science and Technology (No. TJ-IRB20210314). All participants read and signed a consent form approved by the Ethics Committee of the Affiliated Tongji Hospital of Huazhong University of Science and Technology, and they were advised that the collected data would be submitted for publication.

Instrument

This study utilized a self-administered questionnaire specifically created for this research. The questionnaire was developed based on validated and established questionnaires and consisted of three parts [11, 12]. The first part of the questionnaire focused on gathering participant characteristics, including age, gender, BMI, work experience, working hours/week, and physical activity. The second part was an adapted version of the Standardized Nordic Questionnaire (NMQ), which has undergone validation and has been extensively utilized in China [13–15]. It was used to assess the presence of musculoskeletal complaints among the participants. In this study, the questionnaire divides the human body into nine anatomical regions: neck, shoulder, upper back, elbow, wrist- hands, lower back, hip-thighs, knees, and ankle-feet. The division is established based on two criteria: regions where symptoms frequently manifest and regions that can be differentiated from one another [11]. However, participants were requested to indicate any challenges or problems they experienced within the specified anatomical regions during the last 12 months [11]. The third part of the questionnaire included specific questions to assess the risk factors related to WMSDs among pediatric and adult PTs. The measurements were assessed using a binary scale (Yes/No). The participants in the pediatric and adult PTs groups who experienced WMSDs were requested to assess the extent of 17 work factors, as identified in previous studies [7].

Statistical analysis

The statistical package for the social sciences (SPSS) statistical software version 29.0 (IBM SPSS Corp., Armonk, New York) was used to analyze the collected data. Descriptive statistics, such as frequencies and percentages, were employed to evaluate the prevalence of WMSDs, risk factors, and participants' demographic characteristics. To compare the demographic variables and working hours between pediatric and adult PTs, Chi-square tests were conducted. Frequencies and cross-tabulations were utilized to compare the proportions of MSDs affecting different body sites and to examine the relationship between risk factors among pediatric and adult PTs. Logistic regression analysis was employed to determine the risk factors associated with WMSDs. Odds ratios (OR) and their corresponding 95% confidence intervals (CI) were computed. Statistical significance was determined by considering differences with a P-value of < 0.05.

RESULTS

Of the 192, they were 129 PTs (67.18%) enrolled in the current study. They divided into the pediatric PTs group (53.9%, n = 62) and the adult PTs group (63.8%, n = 67). Among the pediatric PTs group, 48 (77.6%) were males. While, in the adult PTs group, 53 (79.1%) were males. The mean age among the pediatric PTs group, it was 33.15 ± 9.357 years, while in the adult PTs group was 32.89 ± 8.193 years. The highest percentage of participants within the 20-30 year age range was 54.8% in pediatric PTs and 47.8% in adult PTs. There was a significant association between BMI and both

PTs groups (P-value = 0.019). However, approximately half of the pediatric PTs (n = 36, 58.1%) and adult PTs (n = 34, 50.7%) had a BMI range of 21-25 kg/m^2. Concerning work experience, there was a significant association observed (P-value = 0.018). Furthermore, 31 (50%) participants in the pediatric PTs and 26 (38.3%) in the adult PTs had 5–10 years of experience. Similarly, the adult PTs group had an equal distribution of participants working 20-30 hours/week and 31-40 hours/week (n = 23, 34.3% in each category). However, about half of the participants performed physical activities in both groups (Table 1).

In pediatric PTs, 53.9% experienced WMSDs in at least one area during the last year, compared to 63.8% in adult PTs. The most common injured regions in the pediatric PTs group were the lower back (n = 46, 74.2%) and neck (n = 36, 58.1%), followed by shoulder, hands-wrist, upper back, knee, hip-thigh, elbow, and ankle-foot. In contrast, the most common injured regions in the adult PTs group were the lower back (n = 44, 65.7%) and knee (n = 44, 65.7%), followed by shoulder, hands-wrist, neck, hip-thigh, elbow, ankle-foot, and upper back (Table 2).

The variations showed predictor differences between the pediatric and adult PTs groups for age, gender, BMI, work experience, working hours/week, and physical activity. Work experience, working hours/week, and physical activity were risk factors in WMSDs among all PTs. While BMI was a risk factor in adult PTs. However, working < 20 and 21–30 hours/week are risk factors among pediatric PT, while working < 20 hours/week was a risk factor in adult PTs (Table 3).

In the pediatric PTs group, the most common work factors contributing to WMSDs were working in the same position for a long period (26.9%), lifting/transferring dependent patients, assisting patients during gait activities, and treating a large number of patients in a day (24.1%). However, in the adult PTs group, the highest percentages of risk factors were treating a large number of patients in a day (77.6%) and working in the same position for long periods (65.7%) (Figure 1).

Table 1. Comparing demographic variables and working sittings between pediatric and adults PTs.[†]

Variables	Category	Pediatric PTs n = 62	Adults PTs n = 67	P-value
		No. (%)	No. (%)	
Gender				
	Male	48(77.6%)	53(79.1%)	0.492
	Female	14(22.6%)	14(20.9%)	
Age (year)				
	20–30	34(54.8%)	32(47.8%)	0.725
	31–40	20(32.3%)	27(40.3%)	
	41–50	6(9.7%)	7(10.45)	
	51–60	2(3.2%)	1(1.5%)	
BMI(kg/m^2)				
	15–20	4(6.5%)	11(16.4%)	0.019*
	21–25	36(58.1%)	34(50.7%)	
	26–30	19(30.6%)	11(16.4%)	
	31–40	3(4.8%)	11(16.4%)	
Work experience (year)				
	< 5	22(35.5%)	15(22.4%)	0.018*
	5–10	31(50%)	26(38.8%)	
	10–15	7(11.3%)	21(31.3%)	
	> 15	2(3.2%)	5(7.5%)	
Working (hours/week)				
	< 20	6(9.7%)	10(14.9%)	0.217
	20–30	32(51.6%)	23(34.3%)	
	31–40	12(19.4%)	23(34.3%)	
	41–50	6(9.7%)	6(9%)	
	> 50	6(9.7%)	5(7.5%)	
Physical activity				
	No	31(50%)	35(52.2%)	0.861
	Yes	31(50%)	32(48.8%)	

[†] PTs: Physiotherapists; BMI: Body mass index.

Table 2. Prevalence of WMSDs among pediatric PTs and adults PTs in China.[*]

Variables	Category	Pediatric PTs No. (%)	Adults PTs No. (%)
Neck			
	No	26(41.9%)	38(56.7%)
	Yes	36(58.1%)	29(43.3%)
Shoulder			
	No	27(43.5%)	34(50.7%)
	Yes	35(56.5%)	33(49.3%)
Elbow			
	No	45(72.6%)	42(62.7%)
	Yes	17(27.4%)	25(37.3%)
Hands -wrist			
	No	38(61.3%)	37(55.2%)
	Yes	24(38.7%)	30(44.8%)
Upper back			
	No	38(61.3%)	48(71.6%)
	Yes	24(38.7%)	19(28.4%)
Lower back			
	No	16(25.8%)	23(34.3%)
	Yes	46(74.2%)	44(65.7%)
Hip-thigh			
	No	42(67.7%)	41(61.2%)
	Yes	20(32.3%)	26(38.8%)
Knee			
	No	39(62.9%)	23(34.3%)
	Yes	23(37.1%)	44(65.7%)
Ankle-foot			
	No	50(80.6%)	43(64.2%)
	Yes	12(19.4%)	24(35.8%)
Therapist with WMSDs			
	No	53(46.1%)	38(36.2%)
	Yes	62(53.9%)	67(63.8%)

[*] PT: Physiotherapists; WMSDs: Work-related musculoskeletal disorders.

DISCUSSION

The WMSDs are a prevalent concern among PTs who provide care to pediatric and adult patients. This study high-

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Table 3. Predictors of WMSDs among PTs groups.*

Predictors	Category	OR	Pediatric-95% CI	P-value	Adult-95% CI	P-value
Gender	Male	15.376	–2.778–0.283	0.110	–0.744–6.210	0.123
	Female		Reference category			
Age	20–30	0.001	0.015–2.846	0.237	1.005–6	0.079
	31–40	<0.001	0.020–3.160	0.285	1.232–8	0.040
	41–50	<0.001	0.049–13.103	0.876	8.924–10	0.066
	51–60		Reference category			
BMI	15–20	45.769	–14.976–0.574	0.069	–0.049–7.696	0.053
	21–25	0.347	–10.439–4.209	0.404	2.860–0.280	0.596
	26–30	<0.001	–10.706–3.936	0.365	0.000–0.280	0.999
	31-40	<0.001	Reference category			
Work experience (year)	<5	<0.001	0.002–0.724	0.030	–3.292–7.398	0.007
	5–10	<0.001	0.001–0.373	0.009	–1.600–6.193	0.013
	10–15		0.009–4.143	0.296	–1.267–5.688	0.017
	> 15		Reference category			
Working (hours/week)	<20	465.393	1.593–7.263	0.002	–0.207–12.493	0.058
	20–30	3.809	0.274–5.087	0.029	–3.768–6.443	0.608
	31-40	0.314	–2.167–3.603	0.626	–6.545–4.231	0.674
	41-50		–0.224–5.283	0.072	–8.027–4.604	0.595
	> 50		Reference category			
Physical activity	No	1.7742	0.027–0.469	0.003	0.001–0.558	0.022
	Yes		Reference category			

* PT: Physiotherapists; BMI: Body mass index; OR: Odds ratios; CI: Confidence intervals; Reference category: refers to the baseline category against which other categories are compared.

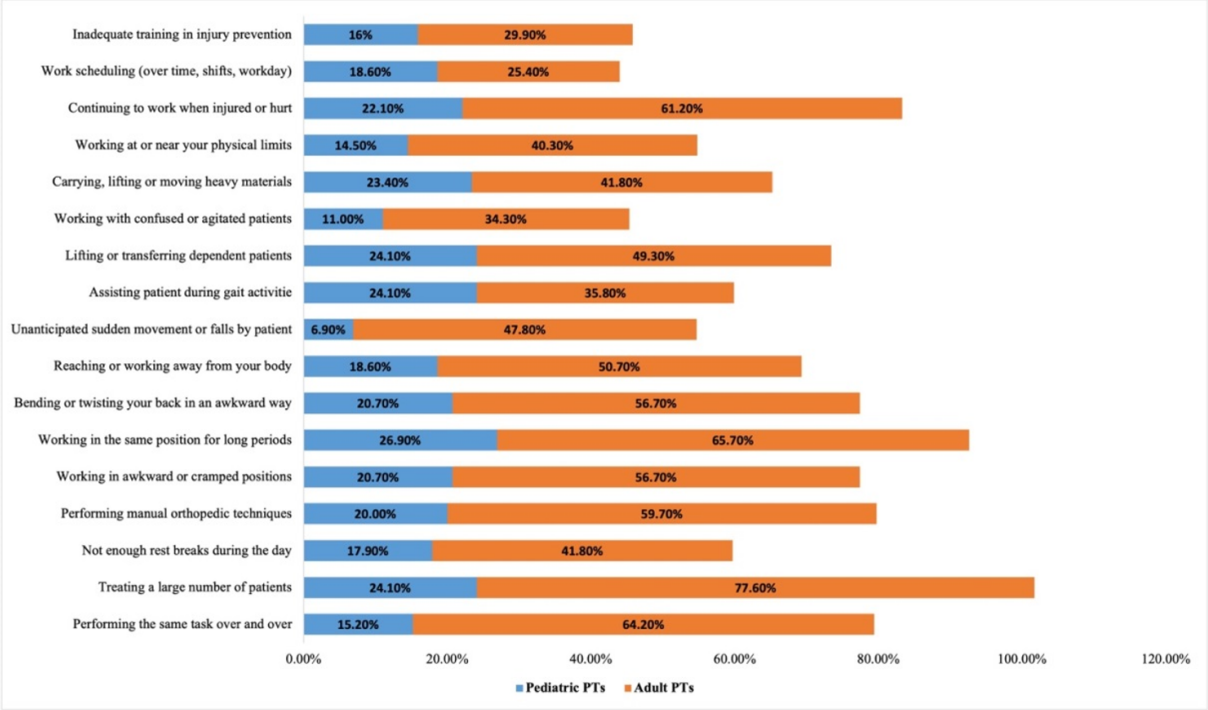

Figure 1. Percentage of risk factors related to WMSDs in pediatric and adult PTs groups.*

* WMSDs: work-related musculoskeletal disorders; PT: Physiotherapists.

lights a high prevalence of WMSDs, with 53.9% in pediatric PTs and 63.8% in adult PTs. A key strength of our study is the identification of specific risk factors, such as long working hours and certain patient handling tasks, which vary between pediatric and adult PTs. These findings underscore the need for targeted ergonomic interventions and workload manage-

ment strategies to mitigate these risks. The implications for clinical practice include the potential for improved PTs well-being and performance through tailored prevention programs and policies that address these identified risk factors.

This study revealed a higher representation of males in pediatric and adult PTs groups compared to their female counterparts, which is consistent with previous studies [16] and contradicts other studies [[17, 18]. Most of the PTs were young due to the good physical abilities required by the profession's tasks.

A significant difference (P-value = 0.019) was observed between pediatric PTs and adult PTs. Furthermore, the majority of participants in both groups had a BMI in the range of 20–25 kg/m^2. This may have a lower level of physical activity, which could increase the risk of WRMDs. There were significant differences observed in work experience between pediatric and adult PTs. Pediatric PTs require additional training to specialize in treating children, which can result in differences in work experience compared to adult PTs. In general, the duration of physiotherapy sessions varies based on patient needs and treatment goals. Duration is determined on a case-by-case basis, considering patient comfort and effective treatment [19]. Most of the PTs had long worked, so regular breaks and proper scheduling helped to manage the workload and prevent strain on therapists.

The prevalence of WMSDs was 53.9% in pediatric PTs and 63.8% in adult PTs, which is lower than previous studies [10, 17, 20, 21], possibly due to differences in study populations, methodologies, or workplace environments. Among pediatric PTs, the most common WMSDs were in the lower back, neck, and shoulder regions. This finding is consistent with the results reported by Ezzatvar et al. [18], where they observed a high prevalence of WMSDs in the lower back (67.9%), neck (63.2%), and shoulder (58.5%) among pediatric PTs. In contrast, the most affected regions in the adult PTs were the lower back and knee; this finding is consistent with the previous study [22].

This study revealed that a high BMI is one of the most important risk factors for the development of WMSDs in adult PTs [22]. Furthermore, this study found that < 5, and 5-10 years of work experience (OR= 0.037, 0.019, respectively) in the pediatric PTs group have a higher risk of developing WMSDs than 10–15 years of work experience. While the < 5, 5–10, and 10–15 years of work experience in the adult PTs group have a higher risk (OR = 0.001), which consistent with the previous study [18].

PTs with long working hours/week are at higher risk of having WMSDs compared to those who work shorter hours. This finding aligns with previous studies that have demonstrated a significant correlation between long working hours/week and the risk of WMSDs among healthcare professionals [23], including PTs [17, 18, 24]. However, long working hours increase the risk of WMSDs due to prolonged physical stress, insufficient recovery time, and increased workload, which exacerbate musculoskeletal strain and fatigue.

Numerous studies have examined the relationship between physical activity and health and indicated that various health factors are associated with different levels of physical activity [25, 26]. However, there is limited evidence regarding the influence of regular physical activity on WMSDs among PTs. Nonetheless, engaging in regular exercise may play a preventive role in reducing discomfort in the neck and shoulder regions [27]. This study showed that physical activity was a risk factor in both pediatric PTs and adult PTs groups, which does not agree with the previous studies [16, 20]. The current study had more developed treatment methods and technology, which provide a higher protocol and reduce the work risk for PTs. Additionally, methodological discrepancies, such as variations in outcome measures or statistical analyses employed, could contribute to the disparities observed between the current study and prior research on the predictors of WMSDs among pediatric and adult PTs.

This study identified certain factors that are likely to restrict the pediatric PTs ability to sustain a physically demanding role. These include prolonged working hours in the same place, lifting and transferring patients, assisting patients during gait activities, and managing a high number of patients in a day. However, treating a large number of patients in a day and working in the same position for a long time were the most common risk factors observed in the adult PTs group. This finding strongly agrees with Adegoke et al. [28]. The findings of this study will contribute to the development of evidence-based strategies to reduce the occurrence and impact of WMSDs among PTs, ultimately improving the occupational health and safety of these dedicated healthcare professionals. By examining these factors, the study aims to contribute to a better understanding of the unique challenges and potential differences in MSDs patterns among pediatric PTs and adult PTs.

The main limitation of this study is that it's a cross-sectional design, which means that the exposure and outcome were assessed simultaneously. The researcher restricted this survey to a 12–month prevalence, which would have fewer participants' memories than the conventional lifetime. Moreover, the study did not explore the interplay between MSDs and other risk factors such as physical load, psychosocial load, and general health status.

This study presented novel data by comparing WMSDs between pediatric PTs and adult PTs groups, which is unprecedented globally. Furthermore, it is the first study to investigate the prevalence and work-related factors of WMSDs among PTs in China. Additionally, the study highlights the importance of conducting further research on the behavioral consequences of WMSDs and the career attitudes of Chinese PTs towards these disorders. Data are scarce regarding WMSDs, specifically in pediatric and adult PTs groups. Most studies in musculoskeletal epidemiology do not assess this specific area within the physical therapy field. Therefore, it is not feasible to compare the prevalence rates of WMSDs in pediatric and adult PTs with those found in other studies. These outcomes underscore the importance of developing targeted interventions and ergonomic strategies to prevent and manage WMSDs among PTs based on their specific patient populations.

CONCLUSION

This study highlights a high prevalence of WMSDs among PTs in tertiary hospitals in China, with distinct risk factors between pediatric and adult PTs. Pediatric PTs were more impacted by long working hours in the same position, lifting/transferring patients, and assisting in gait activities. While adult PTs faced higher risks from treating large numbers of patients and prolonged static positions. To mitigate these risks, we recommend implementing ergonomic interventions such as adjustable workstations and regular breaks, along with task rotation strategies and workload management. Comprehensive training on ergonomics and patient

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handling, coupled with regular monitoring and individualized support, can further enhance PTs' health and well-being. Addressing factors like BMI with tailored resources will also contribute to reducing the burden of WMSDs among PTs.

ETHICAL DECLARATIONS

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Ethics Approval and Consent to Participate

The study was conducted following the Declaration of Helsinki, and approved by the Ethics Committee of the Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology (protocol code: TJ-IRB20210314). Informed consent was obtained from all subjects involved in the study.

Consent for Publication

Not applicable (no individual personal data included).

Availability of Data and Material

Data sharing does not apply to this article as no new data were created or analyzed in this study.

Competing Interests

The authors declare that there is no conflict of interest.

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Authors' Contributions

Conceptualization, X.T. and R.A.; methodology, R.A.; software, J.A.; validation, X.T. and R.A.; formal analysis, R.A. and J.A.; investigation, X.T.; resources, X.T.; data curation, R.A.; writing—original draft preparation, R.A.; writing, review, and editing, J.A.; visualization, X.T.; supervision, X.T.; project administration, X.T.; funding acquisition. All authors have read and agreed to the published version of the manuscript.

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