Health Survey of Monks Residing in Urban Areas: The Bangkok Noi Model

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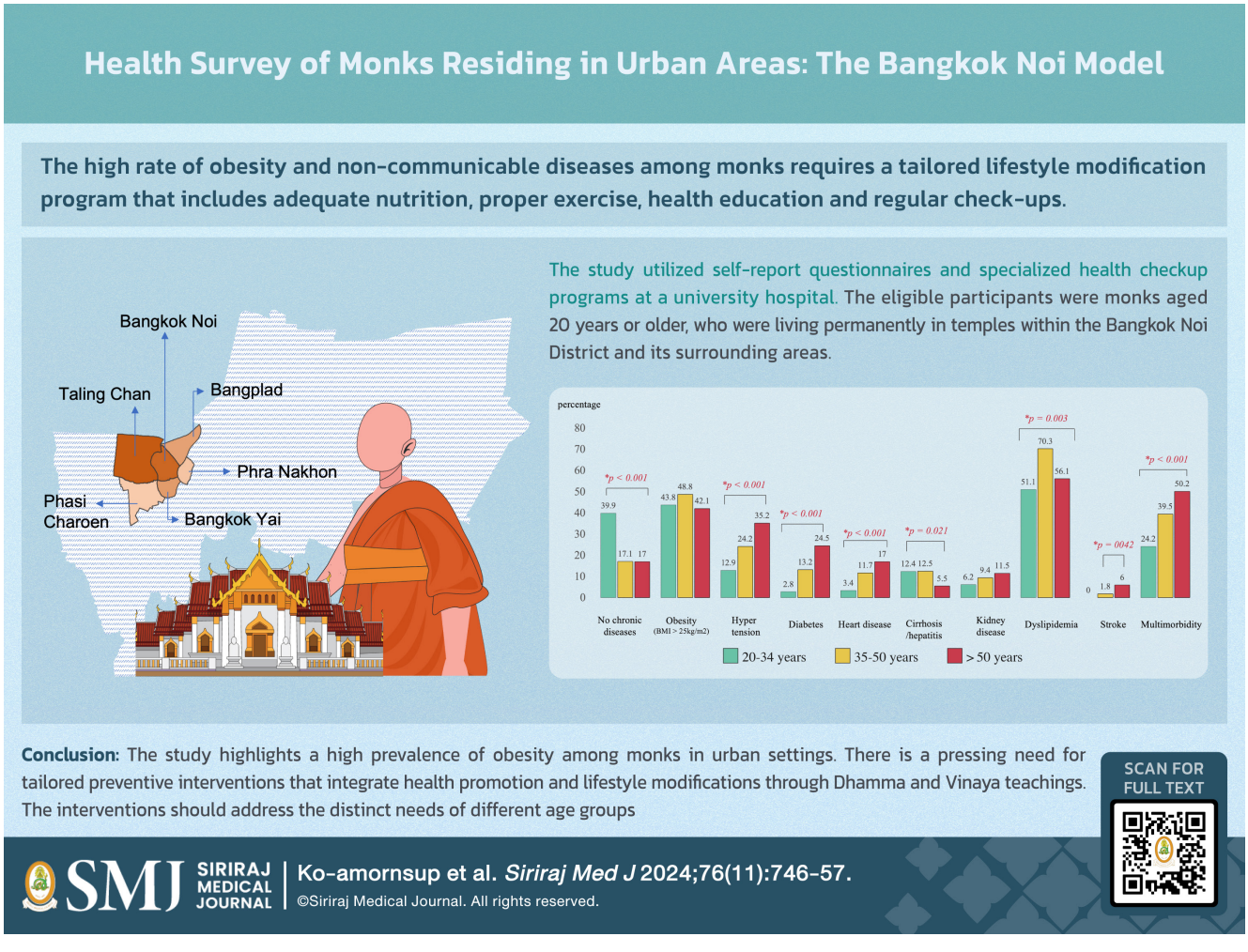

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ABSTRACT

Objective: This study aimed to assess the prevalence of obesity and identify associated health problems and behaviors among monks residing in Bangkok Noi and its adjacent districts.

Materials and Methods: Employing a cross-sectional design, this research incorporated self-report questionnaires and specialized health checkup programs at a university hospital. Eligible participants were monks aged 20 years or older, living permanently in temples within the Bangkok Noi District and its adjacent districts. Monks in short-term ordination were excluded. Data collection occurred between February 2022 and July 2023.

Results: Out of 560 monks who participated by completing both the questionnaires and health examinations, the average age was 46.49±16.97 years. Most participants resided in the Taling Chan (35.4%) and Bangkok Noi (31.8%) districts. Significant health issues included non-communicable diseases, with dyslipidemia affecting 57.8% and obesity 44.2% of the cohort. Monks over the age of 50 exhibited a remarkably higher rate of multimorbidity (50.2%) than their younger counterparts (24.2%, $p < 0.001$, 95% CI 20.71–27.97). Dietary habits revealed that younger monks were more prone to consuming fried, sweet and instant foods (74.5%, $p < 0.001$, 95% CI 70.67–78.07). Moreover, a significant proportion of younger monks demonstrated proficient e-health literacy (74.2%, $p < 0.001$, 95% CI 70.37–77.78).

Conclusion: The study highlights a high prevalence of obesity among monks in urban settings. There is a pressing need for tailored preventive interventions that integrate health promotion and lifestyle modifications through Dhamma and Vinaya teachings. The interventions should address the distinct needs of different age groups.

Keywords: Buddhist monks; Health survey; Noncommunicable diseases; Thailand; Urban (Siriraj Med J 2024; 76: 746-757)

INTRODUCTION

The Asia-Pacific region hosts the most substantial Buddhist populations globally, with Thailand being a prominent Buddhist-majority nation.[1] Buddhism profoundly impacts Thai society, where monks are crucial in preserving and propagating religious teachings.[2] However, urban Thai monks face significant health challenges, due to their increasing adoption of a layperson's lifestyle.[3]

Urbanization is a pivotal 21st-century trend impacting health worldwide. Urban environments, characterized by pollution, heat islands, and confined spaces, hinder active lifestyles and amplify the prevalence of non-communicable diseases (NCDs) while contributing to climate change.[4] In Thailand, NCDs are the predominant cause of mortality, accounting for 74% of all NCD-related deaths and over 400 000 fatalities annually—equivalent to more than 1000 deaths daily. Thai citizens face a 14% risk of premature death (before 70 years) from major NCDs such as cardiovascular diseases, diabetes, chronic respiratory diseases, and cancer, with men and women facing risks of 18% and 11%, respectively.[5,6]

Despite monks' critical roles in practicing and teaching Buddhist principles to alleviate suffering,[7] recent findings indicate a troubling escalation in NCD prevalence within this group. Notably, the prevalence of hypertension in monks is three times higher than in the broader Thai population, at 76% versus 24.7%.[8,9] Furthermore, approximately 62% of monks are classified as overweight, with a body mass index (BMI) of 25 kg/m^2 or higher.[10,11]

The health challenges faced by monks, particularly those related to NCDs, profoundly affect their quality of life. Consequently, there is a critical need for prevention measures and healthcare support systems tailored specifically for this population. In response, in 2017, several pivotal Thai institutions, including the Ministry of Public Health, the National Buddhism Office, the National Health Security Office, and the National Health Commission Office, jointly passed a resolution to enforce nationwide health regulations for monks. The primary goal is to empower monks to manage their health in accordance with Buddhist disciplinary principles.[12] This initiative encompasses efforts in five strategic areas: enhancing knowledge, improving access to information, fostering community health development, providing healthcare services, and conducting research to better support monk health and manage risk factors.

The Bangkok Noi Model, a community health system study conducted by the Faculty of Medicine Siriraj Hospital, collected extensive data on the physical, mental, and social health of Bangkok Noi residents.[13,14] However, monks were not included in that study. Our research specifically targeted the health and lifestyle of monks, aiming to provide comprehensive health data for

the urban setting of Bangkok Noi, thus encompassing all demographic groups within the community. Current data indicates there are 457 temples in Bangkok, with the Bangkok Noi district having the highest concentration at 32 temples, followed by the Taling Chan district with 30 temples.[15] This study aimed to assess the prevalence of obesity and identify associated health problems and behaviors among monks residing in Bangkok Noi and its adjacent districts.

MATERIALS AND METHODS

This cross-sectional investigation forms part of the "Sustainable Development of Health Promotion System for Monks by Interdisciplinary Teams and Public Participation: Bangkok Noi model," authorized under COA number 048/2564 (IRB2). The program's goal is to enhance health knowledge among monks through advanced healthcare services that facilitate remote communication system integration and the generation of tailored health plans based on collected monk health data.

Ethical approval for the study was obtained from the pertinent ethics committee, which confirmed adherence to established ethical standards and guidelines for human research. Monks residing in temples within the Bangkok Noi district and its adjacent areas were invited to engage in this study voluntarily. The inclusion criteria specified monks aged 20 years and above residing at temples in Bangkok Noi District and its vicinity. Conversely, the exclusion criteria encompassed monks undergoing short-term ordination, such as temporary ordination, ordination for a specific ritual, or ordination lasting less than 1 year (Supplementary Materials: Fig 1). Research assistants provided comprehensive explanations about the health checkup programs and the self-report questionnaires. These explanations covered the objectives, procedures, potential benefits, and possible risks involved. This discussion took place before the participants scheduled their appointments at the hospital.

Sample size estimation and statistical analysis

The total sample size of this study was 560 monks, drawn from a total population of 13 112 monks in Bangkok in 2021.[15] The primary objective of this study was to survey the behavior and health status of monks in Bangkok, with a specific focus on chronic diseases such as obesity, diabetes, and hypertension. The estimation of the sample size was based on previous research concerning non-communicable diseases and social determinants of health among Buddhist monks,[9] alongside data from a study of urban health among 283 monks in Samut Prakan Province, Thailand.[16] The latter study revealed that 25.4% of monks were obese. Using the estimated population proportion formula, with an assumed obesity prevalence of 25.4% among monks, an acceptable margin of error of 3.8% was set. This margin was calculated from a 15% margin of the population proportion (d = 15% * 0.254 = 0.038), alongside a confidence level of 95% and a two-sided type I error of 0.05. Thus, the required sample for monks in the Bangkok Noi District was approximately 505 individuals.

Statistical analyses were performed using IBM SPSS Statistics (version 29; IBM Corp, Armonk, NY, USA). Baseline demographic data were summarized by data type. Continuous variables are presented with means and standard deviations if normally distributed, or medians and ranges for non-normally distributed data. Categorical data are represented as frequencies and percentages.

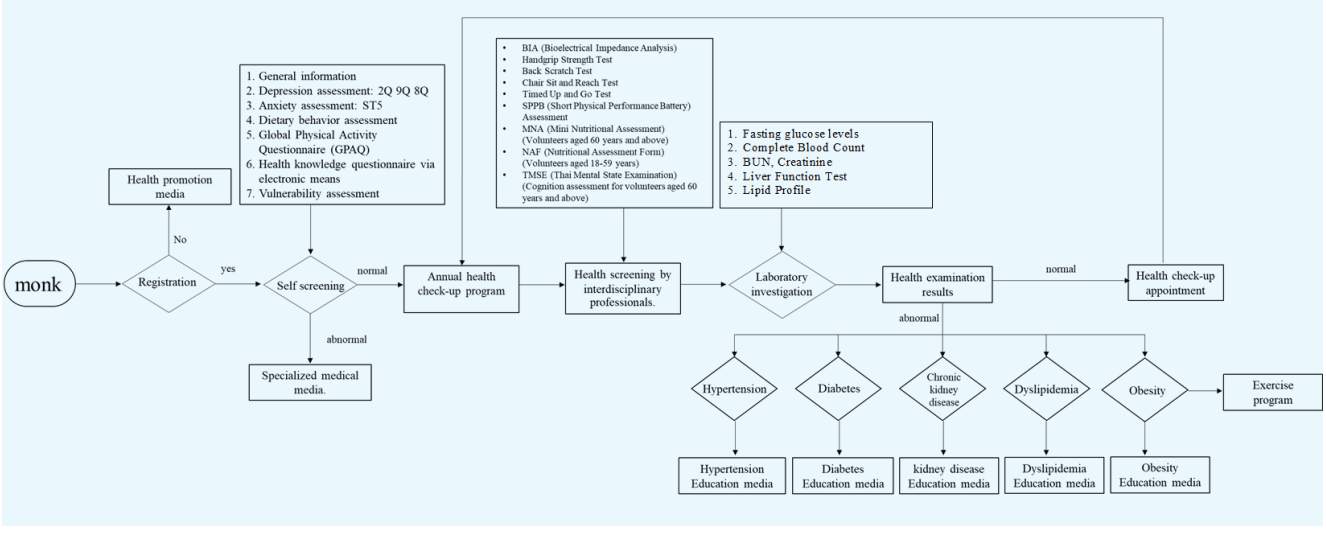

Fig 1. Overview of specialized health checkup program initiative.

Data collection

Data collection was conducted via health checkup stations and standardized questionnaires. Surveys were conducted in Bangkok Noi area from February 2022 to July 2023. Fig 1 provides an overview of the specialized health checkup program initiative. Monk volunteers completed self-screening questionnaires before undergoing a scheduled health checkup at the Siriraj Checkup Center. Nurses, nutritionists, health educators, and trained personnel collected data on the health checkup day. All gathered data were electronically logged and securely maintained in a dedicated database. Rigorous protocols were in place to guarantee the confidentiality and privacy of all monks participating in the study throughout the data collection phase.

Self-report questionnaire

The questionnaire employed in this study was a paper-based structured survey designed to captured comprehensive details about participants' health, lifestyle, and medical history (see Supplementary Materials Table 1 for references). To evaluate mental health, three primary tools were utilized: the 2Q and 9Q depression-rating scales for depressive symptoms assessment and the ST-5 stress test questionnaire for stress levels. Lifestyle and quality of life measurements included the frailty questionnaire, the EQ-5D-5L for health-related quality of life, a dietary behavior assessment, the Global Physical Activity Questionnaire, and an evaluation of e-health literacy.

Health screening and laboratory investigations

Health screenings were meticulously conducted by an interdisciplinary team comprising nurses, nutritionists, health educators, and trained personnel. Laboratory investigations were performed by personnel from the Siriraj Checkup Center, including nurses and physicians (details of laboratory investigations are provided in Supplementary Materials Tables 2 and 3). These included blood tests for fasting glucose levels and lipid profiles, along with other essential biochemical parameters. Imaging tests, such as chest X-rays and electrocardiograms, were performed based on each participant's age and health condition.

Physical fitness was assessed by health educators and trained personnel at the Siriraj Checkup Center using multiple tests to evaluate different physical capabilities. Body composition was analyzed using bioelectrical impedance analysis. Muscle strength was measured with a hand-grip test. Flexibility was assessed using the back scratch test and the chair sit-and-reach test. Balance and activities of daily living were evaluated through the timed up and go test and the Short Physical Performance Battery.

Multimorbidity

Multimorbidity is defined as the simultaneous occurrence of at least two chronic conditions within an individual.[17] The likelihood of multimorbidity escalates with age, potentially increasing susceptibility to diseases and diminishing resistance to acute health threats, such as infections.[18] In this study, health data were gathered from health checkups conducted at Siriraj Checkup Center. Multimorbidity was diagnosed by physicians and assessed by analyzing chronic disease data. The condition was identified when an individual was diagnosed with at least two chronic conditions, including hypertension, diabetes, heart disease, cirrhosis/hepatitis, kidney disease, dyslipidemia, and stroke.

RESULTS

Demographic information of the participants

In total, 560 monks across six districts participated, completing both the questionnaire and health checkups. The distribution was primarily in Taling Chan (197 monks, 35.4%) and Bangkok Noi (177 monks, 31.8%; Table 1). Participants were grouped into three age categories. Monks older than 50 years represented the largest contingent (253 monks, 45.18%), followed by the 20–34 year age group (178 monks, 31.79%) and the 35–50 year age group (129 monks, 23.04%). High educational levels (i.e., high school level or higher) were prevalent among the participants. Older age groups reported more physical issues, such as problems with vision, hearing, and dental health, than their younger counterparts.

According to the health checkup data (Table 2), only 24.3% of participants were free from any diseases. Among those aged over 50, multimorbidity was the most common condition, succeeded by dyslipidemia, hypertension, and diabetes. Conversely, among the middle-aged group, dyslipidemia surfaced as the predominant health issue with a significantly higher incidence than other age groups. Younger participants primarily faced health challenges related to dietary behavior and physical activity levels, exhibiting prevalent conditions such as obesity, dyslipidemia, and hepatitis.

The survey yielded vital insights into the health status of Buddhist monks (Table 2), highlighting a substantial prevalence of elevated BMI: 44.2% of all monks had a BMI exceeding 25 kg/m^2. The obesity rate was notably highest among monks aged between 35 and 50 years, at 48.8%. The age groups of 20–34 and over 50 years showed obesity rates of 43.8% and 42.1%, respectively.

TABLE 1. Demographic characteristics of participating monks (n=560).

Variable	Total (n=560)	20-34 years (n=178)	35-50 years (n=129)	> 50 years (n=253)	*p*
District					<0.001
Bangkok Noi	177 (31.6%)	48 (27.0%)	39 (30.2%)	90 (35.6%)	
Taling Chan	199 (35.5%)	55 (30.9%)	39 (30.2%)	105 (41.5%)	
Bangkok Yai	86 (15.4%)	42 (23.6%)	29 (22.5%)	15 (5.9%)	
Bangplad	76 (13.6%)	25 (14.0%)	15 (11.6%)	36 (14.2%)	
Phra Nakhon	17 (3.0%)	8 (4.5%)	4 (3.1%)	5 (2.0%)	
Phasi Charoen	5 (0.9%)	0 (0.0%)	3 (2.3%)	2 (0.8%)	
Education level					
Less than high school diploma	161 (29.0%)	37 (21.0%)	27 (21.1%)	97 (38.6%)	<0.001
High school diploma or higher	394 (71.0%)	139 (79.0%)[a]	101 (78.9%)[a]	154 (61.4%)[b]	
Not available	5 (0.9%)	2 (1.1%)	1 (0.8%)	2 (0.8%)	
Buddhist education					0.659
Uneducated	70 (12.5%)	22 (12.4%)	13 (10.1%)	35 (13.8%)	
Nak-Dham Tri and Tho	141 (25.2%)	40 (22.5%)	33 (25.6%)	68 (26.9%)	
Nak-Dham Aek and above	344 (61.4%)	114 (64.0%)	82 (63.6%)	148 (58.5%)	
Not available	5 (0.9%)	2 (1.1%)	1 (0.8%)	2 (0.8%)	
Treatment method					
Hospital or nearby healthcare facility	506 (90.4%)	159 (89.3%)[a]	109 (84.5%)[a]	238 (94.1%)[b]	0.009
Self-medication, traditional medicine	494 (88.2%)	154 (86.5%)	118 (91.5%)	222 (87.7%)	0.402
Smoking habits					
Smoker: currently smoking	80 (14.3%)	23 (12.9%)	19 (14.7%)	38 (15.0%)	0.837
Smoker: quit smoking	129 (23.0%)	26 (14.6%)[a]	31 (24.0%)	72 (28.5%)[b]	0.003
Vision problems	286 (51.5%)	64 (36.4%)[b]	69 (53.9%)[a]	153 (61.0%)[a]	<0.001
Hearing problems	82 (14.8%)	11 (6.3%)[b]	21 (16.4%)[a]	50 (19.9%)[a]	<0.001
Dental health problems	213 (38.4%)	44 (25.0%)[a]	43 (33.6%)	126 (50.2%)[b]	<0.001

[a, b] The letter difference is significant at the 0.05 level.

The prevalence of chronic diseases exhibited considerable variation among different age groups. In participants aged over 50, multimorbidity was notably prevalent, affecting 50.2% of this group, in stark contrast to 24.2% in the younger cohort ($p < 0.001$). Furthermore, 56.1% of the older participants suffered from dyslipidemia, followed by hypertension at 35.2% and diabetes at 17.0%. Interestingly, the prevalence of hepatitis was significantly lower in this older group (5.5%) compared to the other age groups ($p < 0.001$).

In the middle-age group (35–50 years), dyslipidemia emerged as the most prevalent condition, affecting 70.3% of participants. This rate was significantly higher than in the older and younger groups, which recorded dyslipidemia prevalences of 56.1% and 51.1%, respectively (p 0.003). The pattern of disease presence in this group aligned somewhat with the older cohort, with prevalences of hypertension, diabetes, and hepatitis at 24.2%, 13.2%, and 12.5%, respectively. For the younger group, the principal health concerns were tied to dietary behavior

and physical activity levels. This group exhibited obesity in 43.8% of individuals, dyslipidemia in 51.1%, and hepatitis in 12.4%.

Self-screening reports

Health behavior

The health behavior screening highlighted the dietary patterns and physical activity levels among monks. Overall, a common dietary behavior was the consumption of fruit and vegetables. Despite this, younger and middle-aged monks tended to consume significantly higher amounts of sweets, desserts, fried foods, and instant food than the older age group. However, there were no significant differences in food hygiene across the age groups.

Physical activity levels among the monks were assessed using the Global Physical Activity Questionnaire. This instrument helped differentiate physical activity by intensity across various age groups. For low and moderate-intensity activities, which include moderate labor and transportation movements, the median value across all age groups was 1680 MET-minutes. This indicates a moderate engagement in these types of activities among monks. Regarding vigorous-intensity physical activity, characterized by activities requiring maximal oxygen uptake,[19] such as carrying heavy loads, the median value for all age groups was documented at 1200 MET-minutes (ranging from 80 to 30 240 MET-minutes). This also reflects a moderate level of engagement in vigorous activities among monks. The assessment of basal metabolic rate, which measures the caloric expenditure for basal life-sustaining functions,[20] revealed age-related differences among participants. Older monks exhibited a significantly lower metabolic rate (1350.54±196.51) than the younger (1546.66±269.78) and middle-aged groups (1520.38±215.82), with $p < 0.001$.

The self-screening reports provided further insights into the health status across different age groups. The EQ5D5L quality of life questionnaire scores averaged at 0.919±0.119 for the older group, which was lower than the 0.947±0.982 score of the younger group (p 0.023; Table 3). However, no significant differences were observed in mental health as assessed by the Depression and Stress Test questionnaires; most participants reported no issues. The FRAIL questionnaire results also indicated that a majority of participants were categorized as fit.

Physical fitness

Muscle mass and handgrip strength were also found to be lower in the older age group relative to younger participants. Similarly, flexibility assessments, measured through the back scratch test and the chair sit-and-reach test, demonstrated reduced flexibility in the older monks. The timed up and go test, a measure of dynamic balance and functional mobility, showed that older monks, with

TABLE 2. Prevalence of chronic conditions and multimorbidity among monks (n=560).

Variable	Total (n=560)	20-34 years (n=178)	35-50 years (n=129)	> 50 years (n=253)	*p*
Diseases					
No chronic diseases	136 (24.3%)	71 (39.9%)[b]	22 (17.1%)[a]	43 (17.0%)[a]	<0.001
Obesity (BMI > 25 kg/m^2)	247 (44.2%)	78 (43.8%)	63 (48.8%)	106 (42.1%)	0.432
Hypertension	143 (25.6%)	23 (12.9%)[b]	31 (24.2%)[a]	89 (35.2%)[a]	<0.001
Diabetes	84 (15.0%)	5 (2.8%)[b]	17 (13.2%)[a]	62 (24.5%)[a]	<0.001
Heart disease	64 (11.4%)	6 (3.4%)[b]	15 (11.7%)[a]	43 (17.0%)[a]	<0.001
Cirrhosis/hepatitis	52 (9.3%)	22 (12.4%)[a]	16 (12.5%)[a]	14 (5.5%)[b]	0.021
Kidney disease	52 (9.3%)	11 (6.2%)	12 (9.4%)	29 (11.5%)	0.178
Dyslipidemia	323 (57.8%)	91 (51.1%)[a]	90 (70.3%)[b]	142 (56.1%)[a]	0.003
Stroke	9 (3.3%)	0 (0.0%)	1 (1.8%)[a]	8 (6.0%)	0.042
Multimorbidity	221 (39.5%)	43 (24.2%)[b]	51 (39.5%)[a]	127 (50.2%)[a]	<0.001

[a, b] The letter difference is significant at the 0.05 level.

TABLE 3. Monk self-report data compilation (n=560).

Variable	Total (n=560)	20-34 years (n=178)	35-50 years (n=129)	> 50 years (n=253)	*p*
Dietary behavior assessment (during the past week, how often did you consume)					
Fresh or cooked vegetables	540 (96.4%)	171 (96.1%)	126 (97.7%)	243 (96.0%)	0.707
Fruits	526 (93.9%)	167 (93.8%)	119 (92.2%)	240 (94.9%)	0.581
Sweets or desserts	482 (86.3%)	135 (76.3%)[a]	97 (75.2%)[a]	167 (66.0%)[b]	0.037
Fried foods	454 (81.5%)	158 (89.3%)[a]	109 (84.5%)[a]	187 (74.5%)[b]	<0.001
Instant food	393 (70.8%)	149 (84.2%)[a]	103 (79.8%)[a]	141 (56.6%)[b]	<0.001
Food hygiene					
Washing fruit and vegetables before cooking	492 (87.9%)	156 (87.7%)	112 (86.8%)	224 (88.5%)	0.891
Using clean food containers for storage	376 (67.1%)	125 (70.2%)	79 (61.2%)	172 (68.0%)	0.411
Eating freshly cooked foods	524 (93.6%)	174 (97.7%)	120 (93.1%)	230 (90.9%)	0.102
Global Physical Activity Questionnaire: GPAQ					
Work activity (low intensity; corresponding to 4 MET/min)	1680 (40, 100 800)	1920 (80, 15 240)	1560 (40, 20 480)	1680 (60,100 800)	0.406
Transport activity (moderate intensity; corresponding to 4 MET/min)	1680 (40, 16 800)	1680 (40, 8400)	1680 (160, 3360)	1680 (40, 16 800)	0.870
Recreation (vigorous intensity; corresponding to 8 MET/min)	1200 (80, 30 240)	1040 (120, 5040)	1160 (80, 6720)	1560 (80, 30 240)	0.145
Depression					0.444
No depression (scores 0–6)	509 (90.9%)	157 (88.2%)	122 (94.6%)	230 (90.9%)	
Mild depression (scores 7–12)	43 (26.7%)	16 (22.2%)	7 (21.9%)	20 (35.1%)	
Moderate depression (scores 13–18)	6 (3.7%)	4 (5.6%)	0 (0.0%)	2 (3.5%)	
Major depression (scores ≥ 19)	2 (1.2%)	1 (1.4%)	0 (0.0%)	1 (1.8%)	
Stress Test Questionnaire (ST5)					<0.001
No problem (scores < 4)	436 (77.9%)	119 (66.9%)	101 (78.3%)	216 (85.4%)	
Might have a problem (scores 5-6)	79 (14.1%)	32 (18.0%)	23 (17.8%)	24 (9.5%)	
Has a problem (scores 7-9)	24 (4.3%)	16 (9.0%)	3 (2.3%)	5 (2.0%)	
Severe problem (scores 10-15)	21 (3.8%)	11(6.2%)	2 (1.6%)	8 (3.2%)	
FRAILTY					0.368
0 (fit)	375 (67.0%)	123 (69.1%)	92 (71.3%)	160 (63.2%)	
1-2 (pre-frail)	169 (30.2%)	52 (29.2%)	34 (26.4%)	83 (32.8%)	
3-5 (frail)	16 (2.9%)	3 (1.7%)	3 (2.3%)	10 (4.0%)	
EQ5D5L	0.933±0.106	0.947±0.982[a]	0.939±0.087	0.919±0.119[b]	0.023
VAS	80.26±14.22	81.87±13.68	80.63±13.91	78.94±14.45	0.100

* The analyzed patients were the ones who answered "yes" to ≥ 1 question of 2Q questionnaire (n=161)

[a, b] The letter difference is significant at the 0.05 level.

an average completion time of 10.61±3.81 seconds, still maintain independence in mobility, including stair navigation and outdoor walking.[21] However, this group's performance was significantly slower compared to the middle-aged (8.05±2.50 seconds) and young (7.53±1.66 seconds) monks ($p < 0.001$; Table 4). Furthermore, the Short Physical Performance Battery, which objectively evaluates functional capacity,[22] produced an average score among all monks of 11.26±1.54, reflecting minimal physical limitations. However, the older age group scored lower (10.73±1.99) than both the younger (11.77±0.68) and middle-aged groups (11.56±0.97, $p < 0.001$), indicating a higher degree of functional impairment in this cohort.

Electronic health literacy

Table 5 outlines the levels of electronic health literacy among monks, showcasing significant age-related disparities. The results indicated that these skills were markedly higher among the younger (74.2%) and middle-aged groups (62.0%). In stark contrast, less than a third of the older participants (30.4%) demonstrated proficiency in electronic health literacy. Within these groups, distinct patterns emerged concerning specific electronic health literacy skills. The younger monks displayed the greatest proficiency in utilizing the related resources available on the internet, with 58.4% demonstrating competence. Meanwhile, the middle-aged group excelled in locating health information online that could be beneficial to their needs, recording a proficiency rate of 48.8%. However, both the younger and middle-aged groups showed lower confidence in using information from the internet to make informed health decisions, reflecting a potential area for educational enhancement.

DISCUSSION

In Thailand, a predominantly Buddhist nation, monks serve as key figures in disseminating Buddhist teachings and represent about 0.3% of the population.[9] Historical perspectives have proposed that health issues among monks are often linked to their adoption of urbanized lifestyles.[3] To address this, our study implemented a strategic approach to gather health data specifically from monks in urban locales, notably Bangkok. This included the establishment of health checkup stations at community temples and comprehensive medical evaluations at Siriraj Hospital.

The preliminary findings from this health survey indicated a demographic skew towards older individuals, with 45% of participants being over the age of 50. This segment of the population exhibited pronounced physical and mental health challenges, including hearing and vision impairments, dental issues, metabolic disorders, multimorbidity, frailty, and symptoms of depression. Due to the monastic discipline that governs Buddhist monks, engaging in vigorous physical activities or sports is generally discouraged. Instead, monks often engage in less strenuous activities such as alms gathering from the Buddhist laity and fulfilling moderate duties at temples.[3,23] Notably, the dietary habits of monks typically depend on food offerings collected during morning alms and lunchtime merit-making events at temples. This diet often mirrors urban eating habits, characterized by easily accessible convenience foods, which may be nutrient-deficient yet calorie-dense, particularly in fats and sugars. Such dietary patterns are contributory factors to the prevalent health issues observed among monks, including dyslipidemia, hypertension, diabetes mellitus, and obesity.[3,24-26] This correlation underscores the need for tailored health interventions that consider both the unique dietary and lifestyle aspects of monastic life and the broader urban health challenges.

By segmenting the monks into three age categories, it became evident that distinct health profiles emerge across different life stages. The youngest group, aged 20–34 years, had the lowest incidence of comorbidities. Nevertheless, stress surfaced as a prevailing issue among all age groups, highlighting the critical need for enhanced mental health support within this community. Among the younger monks, a common dietary pattern included the frequent consumption of desserts, fried foods, and processed items. However, occurrences of dyslipidemia and obesity were comparatively less prominent within this group. This observation could potentially be explained by a combination of higher metabolic rates typically seen in younger individuals and more active lifestyles, which gradually decline with age.[27]

The middle-aged group, 35–50 years, demonstrated the greatest susceptibility to obesity, a trend that decreases with advancing age. This result indicated that the metabolic rate declined with advancing age.[28] This could be related to age-associated reductions in appetite and metabolic shifts.[29] Given the limitations on physical activities imposed by monastic life, there have been suggestions for alternative approaches to maintain physical health among monks. These include engaging in less vigorous but beneficial exercises such as hand, arm, shoulder, and lower body stretching, as well as practices like yoga and qigong. These activities could be effectively integrated with routine temple duties and lifestyle adjustments to promote better health outcomes.[23]

The monks in the senior age group (> 50 years) exhibited the highest frequency of comorbidities, including frailty,

TABLE 4. Assessment of physical fitness parameters at Siriraj Checkup Center.

Variable	Total (n=560)	20-34 years (n=178)	35-50 years (n=129)	> 50 years (n=253)	*p*
Weight (kg)	69.16±15.64	71.55±19.33[a]	72.49±14.91[a]	65.75±1.06[b]	<0.001
Height (cm)	166.51±7.19	168.60±7.20[a]	167.43±7.27[a]	164.57±6.64[b]	<0.001
Body mass index (kg/m^2)	24.95±5.02	25.26±6.24	25.85±4.77[a]	24.27±4.00[b]	0.008
< 18.5 (underweight)	38 (6.8%)	18 (10.1%)	4 (3.1%)	16 (6.3%)	
18.5 - 22.99 (normal weight)	170 (30.4%)	57 (32.0%)	30 (23.3%)	83 (32.9%)	
23 - 24.99 (overweight)	104 (18.6%)	25 (14.0%)	32 (24.8%)	47 (18.7%)	
>24.99 (obese)	247 (44.2%)	78 (43.8%)	63 (48.8%)	106 (42.1%)	
Thai Mental State Examination (TMSE)					-
≤ 23 (dementia)	26 (18.1%)	-	-	26 (18.1%)	
> 23	118 (81.9%)	-	-	118 (81.9%)	
Mini Nutritional Assessment (MNA)					-
Normal nutritional status	100 (68.0%)	-	-	100 (68.5%)	
At risk of malnutrition	43 (29.3%)	-	-	43 (29.5%)	
Malnourished	4 (2.7%)	-	1 (100.0%)	3 (2.1%)	
Nutritional Assessment Form (NAF)					0.028
Low risk of malnutrition	398 (95.9%)	174 (97.8%)	126 (97.7%)	98 (90.7%)	
Moderate risk of malnutrition	16 (3.9%)	4 (2.2%)	3 (2.3%)	9 (8.3%)	
Severe malnutrition	1 (0.2%)	0 (0.0%)	0 (0.0%)	1 (0.9%)	
Physical fitness test					
Bioelectrical impedance analysis					
BMR (calories)	1452.37±244.44	1546.66±269.78[a]	1520.38±215.82[a]	1350.54±196.51[b]	<0.001
Body fat (%)	23.53±7.89	22.87±9.40	23.72±7.89	23.90±6.80	0.405
Muscle mass (kg)	49.11±7.60	50.93±8.08[a]	51.70±6.40[a]	46.50±6.98[b]	<0.001
Handgrip right (kg)	29.76±6.82	32.96±6.56[a]	31.52±5.85[a]	26.59±6.07[b]	<0.001
Handgrip left (kg)	28.40±6.90	31.34±6.33[a]	30.35±6.16[a]	25.32±6.38[b]	<0.001
Back scratch right (in)	-4 (-22, 6.5)	0 (-15, 6.5)[a]	0 (-17, 5)[a]	-7 (-22, 6)[b]	<0.001
Back scratch left (in)	-7 (-27, 15.5)	-3.5 (-19.5, 8)[a]	-6.9 (-21.5, 3.5)[a]	-9 (-27, 15.5)[b]	<0.001
Chair sit-and-reach test, right (in)	0 (-19.5, 10)	0 (-13.5, 8)[a]	0 (-14, 9)	0 (-19.5, 10)[b]	0.003
Chair sit-and-reach test, left (in)	0 (-19, 25)	0 (-14, 7)[a]	0 (-13, 25)	0 (-19, 9.4)[b]	0.002
Timed up and go (sec)	8.86±3.22	7.53±1.66[a]	8.05±2.50[a]	10.61±3.81[b]	<0.001
Short Physical Performance Battery	11.26±1.54	11.77±0.68[a]	11.56±0.97[a]	10.73±1.99[b]	<0.001
Severe limitations	5 (0.9%)	0 (0.0%)	0 (0.0%)	5 (2.0%)	
Moderate limitations	7 (1.3%)	0 (0.0%)	1 (0.8%)	6 (2.4%)	
Mild limitations	38 (6.8%)	3 (1.7%)	2 (1.6%)	33 (13.1%)	
Minimal limitations	507 (91.0%)	174 (98.3%)	126 (97.7%)	207 (82.5%)	

[a, b] The letter difference is significant at the 0.05 level.

TABLE 5. Electronic health literacy levels among monks.

Electronic health literacy	20-34 years (n=178)	35-50 years (n=129)	> 50 years (n=253)	*p*
1. What are the electronic health literacy resources that can be used on the internet?	104 (58.4%)[a]	59 (45.7%)[a]	54 (21.3%)[b]	<0.001
2. Where can you find health information that will benefit you on the internet?	95 (53.4%)[a]	62 (48.1%)[a]	58 (22.9%)[b]	<0.001
3. Do you know the way to find health information that will benefit you?	99 (55.6%)[a]	63 (48.8%)[a]	50 (19.8%)[b]	<0.001
4. Do you know how to use the internet to find information about health?	93 (52.2%)[a]	62 (48.1%)[a]	52 (20.6%)[b]	<0.001
5. Do you know how to utilize health information on the internet to take care of yourself?	86 (48.3%)[a]	57 (44.2%)[a]	49 (19.4%)[b]	<0.001
6. Do you have the necessary skill to assess the reliability of the source on the internet?	76 (42.9%)[a]	57 (44.2%)[a]	45 (17.8%)[b]	<0.001
7. Can you identify reliable health information sources on the internet?	73 (41.2%)[a]	47 (36.4%)[a]	40 (15.9%)[b]	<0.001
8. Do you feel confident in using information from the internet to make health decisions?	71 (39.9%)[a]	47 (36.7%)[a]	44 (17.4%)[b]	<0.001
A high score (4-5) of electronic health literacy in 5 or more questions	132(74.2%)[a]	80 (62.0%)[a]	77 (30.4%)[b]	<0.001

[a,b] The letter difference is significant at the 0.05 level.

diminished quality of life, malnutrition, reduced muscle mass and strength, and decreased physical performance. Compounded by significantly lower levels of electronic health literacy, these factors align with studies suggesting that advanced age often correlates with limitations in digital health literacy.[30-33] Furthermore, cognitive decline is a significant concern in this demographic, with an 18% incidence rate of dementia noted, potentially leading to impaired self-care abilities and increased reliance on external healthcare support.[34]

Given these multifaceted health challenges, lifestyle interventions are crucial for maintaining and enhancing health in senior monks. Dietary modifications and engagement in moderate physical exercises, such as resistance training through temple chores, yoga, and qigong, alongside stretching and morning alms rounds, are advocated. These measures are not only feasible within the constraints of monastic life but are also effective in battling obesity.[35] Importantly, past studies suggest that while heavy exercise might generate proinflammatory cytokines and disrupt serotonin biosynthesis by breaking down essential amino acids such as tryptophan, resulting in fatigue, low mood, and carbohydrate cravings,[36] moderate exercise can offer substantial health benefits without these adverse effects. Thus, tailored physical activities are recommended to optimize well-being and mitigate health risks for aging monks.

Our research represents one of the few studies examining the health status of urban Buddhist monks. However, the study did have limitations. The health survey was conducted by inviting monks primarily from six highly urbanized districts out of the 50 districts in Bangkok. Additionally, about 70% of the participants had achieved at least a high school education, which may correlate with better dietary and food hygiene practices. Consequently, the demographic characteristics of the participating monks might hinder the generalizability of our findings across a broader monk population. Future studies could consider a prospective case-cohort approach to allow a deeper exploration into the health dynamics within this group. Nevertheless, the study showcased several strengths. Although the sample may not fully

represent all monks in Bangkok or in other urban settings, the thorough data collection from central business districts effectively captured the influence of an urbanized lifestyle. Stratifying monks into three distinct age groups illuminated specific health issues and contributory factors relevant to each cohort, particularly highlighting gaps in electronic health literacy.

This investigation significantly enhances our understanding of the health challenges and disparities faced by monks, a group often constrained in terms of engaging in health-promoting activities, such as regular exercise and sustaining a healthy diet. By focusing on a predominantly male cohort, this study also draws attention to diseases that disproportionately impact men, such as stroke and cardiovascular diseases. The extensive data collected provide valuable insights into how urbanization and modern lifestyle factors influence monk health. These findings lay a crucial foundation for devising targeted interventions aimed at boosting health and well-being among monks and similar populations, ultimately fostering enhanced healthcare access and promoting healthier lifestyles within these communities.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

Author Contributions

AS, VS and WM were responsible for the conceptualization. AS ,VS and WM handled the methodology. WS, KA and PP performed data collection. RP carried out the formal analysis. AS, VS and NK managed resources and provided access to crucial research components. AS and WK evaluated the data. WK, RP, PS and AS drafted the original manuscript. WK, RP, PS and AS reviewed and edited the manuscript. AS supervised the project, handled administration, and acquired funding.

REFERENCES

1. Hackett C, Grim B, Stonawski M, Skirbekk V, Potančoková M, Abel G. The Global Religious Landscape: A Report on the Size and Distribution of the World's Major Religious Groups as of 20102012.
2. Arunsutalangkarn P. role of thai buddhist monks and education in thai society. Journal of Buddhist Anthropology. 2023;8(2): 96-103.
3. Attaworakun S, Ngamdee N, Cherdsuntia V. Monk's health in urban area: The Problem that should be considered. Vajira Medical Journal: Journal of Urban Medicine. 2019;63(Supplement):S177-S84.
4. WHO. Urban health ; 2021[cite 2024 June 20] [Available from: https://www.who.int/health-topics/urban-health.
5. World Health Organization. Noncommunicable diseases country profiles 2018. Geneva; 2018. Licence: CC BY-NC-SA 3.0 IGO.
6. World Health Organization (WHO) SEA, Thailand. Prevention and Control of Noncommunicable Diseases in Thailand – The Case for Investment. 2021.
7. Phra Maha Wichian Wachiramotamonuen KA, Kanchanaphet, Phra Khru Sutthakit Somso. The role of monks in modern Thai society development. Journal Maha Chula tani Mahachulalongkorn-rajavidyalaya University. 2021;3(6):42–9.
8. Puckcharern; WALM-sNRWSH. Thai National Health Examination Survey, NHES V. Health Systems Research Institute (HSRI). 2016.
9. Jeamjitvibool T, Tankumpuan T, Lukkahatai N, Davidson PM. Noncommunicable diseases and social determinants of health in Buddhist monks: An integrative review. Res Nurs Health. 2022;45(2):249-60.
10. Angkatavanich J, Ariyapitipun, T., Wisesrith, W., Prasobtham, J., &Punpanich, D. . Situation of Nutritional Problem in Buddhist Monks from Project "Sonkthaiglairok". Bangkok: Thai Health Promotion Foundation (in Thai). 2016.
11. Srimantayamas V, Fongkaew W, Suksatit B, Aree P, Kosachunhanun N. Health Behaviors and Health-Related Quality of Life among Buddhist Monks with Metabolic Syndrome. Pacific Rim Int J Nurs Res. 2020;24(2):159-71.
12. Phrakru Phiphit Sutatorn, PC, WB, TP, PL, NY, et al. National Monks Health Statute. 3rd Floor, National Health Building, 88/39 Tiwanon Road 14, Village No. 4, Talat Khwan Subdistrict, Mueang District, Nonthaburi Province 11000: National Health Commission Office (NHCO); 2017.
13. University FoMSHM. Bangkok Noi Model 2020 [Available from: https://www2.si.mahidol.ac.th/en/sustainable/good-health-and-well-being/bangkok-noi-model/.
14. Gozzoli P, Rongrat T, Gozzoli R. Design Thinking and Urban Community Development: East Bangkok. Sustainability. 2022; 14:4117.
15. Group IT, Department OotS, Buddhism NOo. Basic Information on Buddhism for the Year 20212021.
16. Suchar C. The Relationship between Food Consumption Behavior, and Blood Sugar, Lipid Levels, AND Body Mass Index Among Monks in Samutprakarn Province. HCU Journal. 2018;21(42): 107-21.

17. Skou ST, Mair FS, Fortin M, Guthrie B, Nunes BP, Miranda JJ, et al. Multimorbidity. Nat Rev Dis Primers. 2022;8(1):48.
18. World Health Organization. Multimorbidity: Technical Series on Safer Primary Care. Geneva; 2016. Licence: CC BY-NC-SA 3.0 IGO.
19. CDC. Physical Activity ; 2022 [cite 2024 June 20]. Available from: https://www.cdc.gov/physicalactivity/basics/adults/index.htm.
20. Health Promotion Division FoMSHMU. Basal Metabolic Rate (BMR) 2021. Available from: https://www.si.mahidol.ac.th/th/healthdetail.asp?aid=1472.
21. Wellmon R. Chapter 32 - Gait Assessment and Training. In: Cameron MH, Monroe LG, editors. Physical Rehabilitation. Saint Louis: W.B. Saunders; 2007. p. 844-76.
22. de Fátima Ribeiro Silva C, Ohara DG, Matos AP, Pinto A, Pegorari MS. Short Physical Performance Battery as a Measure of Physical Performance and Mortality Predictor in Older Adults: A Comprehensive Literature Review. Int J Environ Res Public Health. 2021;18(20):10612.
23. Laochai W TD, Jiraprapapong N. Promoting Physical Activity among Buddhist Monks: The Role of Nurse. J Food Health Bioenv Sci. 2023;13(2):59-66.
24. Angthawanich J SA. Thai remote distant media of disease: integrated nutrituon to the Buddhist way 4 sectors. Bangkok: Chor Langa. 2015.
25. hospital P. Health examination program for novice monks 2017. Nonthaburi: Department of Medical Services, Ministry of Public Health2017
26. Bureau H. Screning of the health of monks in Bangkok in 2013: Bangkok: Health Bureau; 2014.
27. Palmer AK JM. Metabolic changes in aging humans: current evidence and therapeutic strategies. J Clin Invest. 2022;27(5):29-35.
28. Shimokata H, Kuzuya F. [Aging, basal metabolic rate, and nutrition]. Nihon Ronen Igakkai Zasshi. 1993;30(7):572-6.
29. Pilgrim AL RS, Sayer AA, Roberts HC. An overview of appetite decline in older people. Nurs Older People. 2015;27(5):29-35.
30. Wang X LW. Research progress on digital health literacy of older adults: A scoping review. Front Public Health. 2022;10:906089.
31. De Santis KK JT, Sina E, Wienert J, Zeeb H. Digitization and Health in Germany: Cross-sectional Nationwide Survey. JMIR Public Health Surveill 2021;7(11):e32951.
32. Papp-Zipernovszky O HM, Schulz PJ, Csabai M. Generation Gaps in Digital Health Literacy and Their Impact on Health Information Seeking Behavior and Health Empowerment in Hungary. Front Public Health. 2021;9:635943.
33. Lin CY GM, Griffiths MD, Bravell ME, Broström A, Pakpour AH. Mediated effects of insomnia, psychological distress and medication adherence in the association of eHealth literacy and cardiac events among Iranian older patients with heart failure: a longitudinal study. Eur J Cardiovasc Nurs. 2020;19(2):155-64.
34. Rees J TR, Burton A, Walters K, Cooper C. Supporting self-care of long-term conditions in people with dementia: A systematic review. Int J Nurs Stud. 2021;116:103432.
35. Clark JE. Diet, exercise or diet with exercise: comparing the effectiveness of treatment options for weight-loss and changes in fitness for adults (18-65 years old) who are overfat, or obese; systematic review and meta-analysis. J Diabetes Metab Disord. 2015;14:31.
36. Strasser B FD. Diet Versus Exercise in Weight Loss and Maintenance: Focus on Tryptophan. Int J Tryptophan Res. 2016;9:9-16.