Unhealthy Weight, Low Physical Activity, and Unhealthful Dietary Practices Among Chinese Gallstone Patients*

การมีน้ำหนักที่ส่งผลเสียต่อสุขภาพ การมีกิจกรรมทางกายต่ำ และการบริโภคอาหารที่ไม่ดีต่อสุขภาพในผู้ป่วยโรคนิ่วในถุงน้ำดีชาวจีน*

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Abstract

A descriptive research design was used in this study to explore unhealthy weight, low physical activity, and unhealthful dietary practices among Chinese gallstone patients in Lincang City, Yunnan Province, the People's Republic of China. Purposive sampling was used to recruit 324 participants from the People's Hospital of Lincang and the Second People's Hospital of Lincang from April, 2020 to June, 2020. Measurement tools included: 1) Demographic Data Record Form; 2) the Body Mass Index (BMI) record form; 3) International Physical Activity Questionnaire (IPAQ); and 4) Start The Conversation: Diet (STC). The translation and back translation method were used to ensure quality of the Chinese version. The test-retest reliability for the IPAQ and STC were 0.84 and 0.71, respectively. Descriptive statistics were used to describe the demographic characteristics, as well as the prevalence of unhealthy weight, low physical activity, and unhealthful dietary practices of the participants.

Results of this study revealed that the prevalence of Chinese gallstone patients who had unhealthy weight, low physical activity level, and unhealthful dietary practices were 72.84%, 70.06% and 30.86%, respectively.

Results from this study confirmed high prevalence of unhealthy weight, low physical activity, and unhealthful dietary practices among Chinese gallstone patients in Lincang City, Yunnan Province, the PRC. Gallstone risk screening and prevention measures can be made possible through these findings.

Keywords: Prevalence, Unhealthy weight, Low physical activity, Unhealthful dietary practices, Chinese gallstone patients

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บทคัดย่อ

การวิจัยเชิงพรรณนานี้มีวัตถุประสงค์ในการสำรวจความชุกของการมีน้ำหนักที่ส่งผลเสียต่อสุขภาพ การมีกิจกรรมทางกายต่ำ และการบริโภคอาหารที่ไม่ดีต่อสุขภาพในผู้ป่วยโรคนิ่วในถุงน้ำดีชาวจีนในเมืองหลินชาง มลฑลยูนนาน ประเทศสาธารณรัฐประชาชนจีน คัดเลือกกลุ่มตัวอย่างแบบเจาะจงจำนวน 324 คน จากโรงพยาบาลประชาชนเมืองหลินชาง และโรงพยาบาลประชาชนเมืองหลินชางแห่งที่สอง เดือนเมษายน ถึง ปลายเดือนมิถุนายน ค.ศ. 2020 เครื่องมือประเมินประกอบด้วย: 1) แบบบันทึกข้อมูลส่วนบุคคล 2) แบบบันทึกค่าดัชนีมวลกาย 3) แบบสอบถามนานาชาติเกี่ยวกับกิจกรรมทางกาย และ 4) เครื่องมือเริ่มการสนทนา: อาหารที่รับประทาน เพื่อให้การแปลมีคุณภาพ เครื่องมือทุกฉบับผ่านการแปลและแปลย้อนกลับเป็นภาษาจีน ค่าความเที่ยงของเครื่องมือจากการทดสอบซ้ำสำหรับแบบสอบถามนานาชาติเกี่ยวกับกิจกรรมทางกาย และเครื่องมือสนทนาเกี่ยวกับ: อาหารที่รับประทาน เป็น .84 และ .71 ตามลำดับ วิเคราะห์ข้อมูลโดยใช้สถิติบรรยายเพื่ออธิบายความชุกของการมีน้ำหนักที่ส่งผลเสียต่อสุขภาพ การมีกิจกรรมทางกายต่ำ และการบริโภคอาหารที่ไม่ดีต่อสุขภาพในผู้ป่วยโรคนิ่วในถุงน้ำดีชาวจีน

ผลการวิจัย พบความชุกของการมีน้ำหนักที่ส่งผลเสียต่อสุขภาพ การมีกิจกรรมทางกายต่ำ และการบริโภคอาหารที่ไม่ดีต่อสุขภาพในผู้ป่วยโรคนิ่วในถุงน้ำดีชาวจีนในเมืองหลินชาง มลฑลยูนนาน ประเทศสาธารณรัฐประชาชนจีน เป็น 72.84%, 70.06% และ 30.86% ตามลำดับ

ผลการวิจัยครั้งนี้ยืนยันความชุกของการมีน้ำหนักที่ส่งผลเสียต่อสุขภาพ การมีกิจกรรมทางกายต่ำ และการบริโภคอาหารที่ไม่ดีต่อสุขภาพในผู้ป่วยโรคนิ่วในถุงน้ำดีชาวจีน ที่เมืองหลินชาง มลฑลยูนนาน ประเทศสาธารณรัฐประชาชนจีน ซึ่งสามารถนำไปใช้ในการคัดกรองและการป้องกันโรคนิ่วในถุงน้ำดีได้

คำสำคัญ: ความชุก การมีน้ำหนักที่ส่งผลเสียต่อสุขภาพ การมีกิจกรรมทางกายต่ำ การบริโภคอาหารที่ไม่ดีต่อสุขภาพ ผู้ป่วยโรคนิ่วในถุงน้ำดีชาวจีน

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Background and significance

Gallstone is on the rise and becoming a major health problem in Chinese population. Some epidemiological surveys showed the prevalence of gallstone in different regions of China ranged from 4.2% to 13.11% (Chen et al., 2012; Xu et al., 2012). According to the rapid industrialization and urbanization, Chinese people way of life has been changed to be westernized style. Increasing number of Chinese people has adopted consuming westernized dietary habits as well as sedentary lifestyle (Chen et al., 2012). However, no official report regarding gallstone has been found in Lincang City nor Yunan Province. According to the People's Hospital of Lincang admission record from 2014 to 2018, there was increased number of gallstone patients by 48.9% each year and in every year, it was accounted for 32.8% - 38.6% among all hospitalized digestive disease patients. Moreover, in 21st century, the prevalence of cholesterol gallstone has increased significantly and accounting for 67.0% among Chinese population (Huang, Chen, & Feng, 2010).

Impacts of gallstone are not only on individuals' physical health but also on psychological and social function as well. It has been estimated that over 90% cases of acute cholecystitis, 80% of bladder cancer, 59% of cholangiocarcinoma, and 41% of ampullary cancer can be attributed to gallstone. Moreover, acute cholangitis and acute pancreatitis which are claimed to be the most serious complications of gallstone that contribute about 24% and 3-20% mortality after the first attack (Stokes, Krawczyk, & Lammert, 2011). Such consequences resulted in an increasing economic and social expenditure and growing burden of medical resources and healthcare facilities (Jone, Mawhinney, & Brown, 2012).

Inherent and environment factors have been identified as factors related to gallstone formation and responsible for the significant increase in the morbidity of gallstone (Stokes et al., 2011). However, factors related to lifestyle including unhealthy weight, low physical activity and unhealthful dietary practice seemed to be the key risk factors influencing an increased predisposition to gallstone formation, especially cholesterol gallstone (Stokes et al., 2011). Moreover, one descriptive epidemiology study suggested consistently that lifestyle factors were responsible for gallstones formation in most cases (Sachdeva, Khan, Ansari, Khalique, & Anees, 2011). Prevalence of modifiable risk factors among patients in certain area should be identified as to be used for screening and designing appropriate measures to prevent them from disease development (Sopajareeya, Sopajaree, Sopajaree, & Ibarra-Mejia, 2018). The National Institute Health and Care Excellence (NICE) quality standard for gallstone disease emphasized on the role of nurses in improving health and disease prevention through encouraging people to adopt healthful lifestyles (Warttig, Ward, & Rogers, 2014).

Lincang city is located at the Southwest border of Yunnan province. People's pace of life, habits and customs are different among one to other areas. In recent years, westernization has been accelerated. Urbanization has driven

more people into city life and faced more barriers to have physically active. In addition, industrialization has transformed primarily agricultural to one based on the manufacturing. Sedentary lifestyle has become mainstream which contributes to a rising body shape change. According to Lincang report, increasing BMI of Lincang population started from the year 2000, and increased even more rapidly after 2005. Overweight and obesity have been found to be increased by 11.75% and 1.03% respectively (Sun, 2018). However, there was limited information regarding the prevalence of gallstone formation risk factors among gallstone patients in Lincang city. Results from this study can possibly be used as input to plan for better gallstone screening and preventive intervention in this city.

Research objectives

To explore the prevalence of gallstone patients who have unhealthy weight, low physical activity level, and unhealthful dietary practices in Lincang City, Yunnan Province, the People's Republic of China.

Research questions

What is the prevalence of gallstone patients who have unhealthy weight, low physical activity level, and unhealthful dietary practices in Lincang City, Yunnan Province, the People's Republic of China?

Conceptual framework

The conceptual framework of this study was based on the verified evidence that unhealthy weight, low physical activity, and unhealthful dietary practices are related to gallstone formation. Incidence of gallstone, especially cholesterol gallstone has increased among Chinese population. This disease creates burdens to the patients not only on physical and psychological, but also on social and financial aspects as well. Prevention is better than cure (Sopajareeya et al., 2018). Nurses have active role in gallstone screening and prevention (Warttig et al., 2014). Determining gallstone formation related factors among the patients is vital.

Lincang City locates in Southwest of Yunnan Province, the People's Republic of China, has becoming industrialized, urbanized, and westernized. This fast-paced environment might have major impact on people's way of living. Unhealthy weight as a result of adopting sedentary lifestyle and unhealthy dietary practices among people are evidences at present time. Unhealthy weight as determined by body mass index (BMI) more than 23 kg/m^2 can be anticipated. Low physical activity and unhealthful dietary practice including eating excess amount of fat and calories with less of fruits and vegetables are believed to be increased as well. As gallstone has increased in China, unhealthy weight, low physical activity, and unhealthful dietary practices are more likely to be related factors of gallstone formation which need to be validated. Gallstone risk screening and prevention measures can be targeted through these findings.

Methodology

Population and sampling

A quantitative descriptive study was conducted among gallstone patients who admitted to the People's Hospital of Lincang and the Second People's Hospital of Lincang, Yunnan province of the People's Republic of China. There were 836 gallstone patients admitted to these two hospitals for surgery in 2018. Applying Taro Yamane's formula (Yamane, 1973) and set significant level at 0.05, participants in this study was 270. Concerning uncompleted data, 20% was added to the sample size. Total participants of this study were 324. Participants who fulfilled the inclusion criteria were identified and recruited. Totally, 324 questionnaires were distributed with response rate in this study was 100%.

Research instruments

Questionnaires used in this study consisted of 4 parts: 1) Demographic Data Record Form; 2) the Body Mass Index (BMI) record form; 3) Chinese version of International Physical Activity Questionnaire (IPAQ) which originally developed by Macfarlane, Chan, & Cerin (2011); and 4) Chinese version of Start The Conversation: Diet (STC) which originally developed by Paxton, Strycker, Toobert, Ammerman, & Glasgow (2011). The translation and back translation method were applied to ensure quality of the Chinese version. The test-retest reliability for the IPAQ and STC were 0.84 and 0.71, respectively.

Ethical consideration

The study was approved by the Research Ethics Review Committee, Faculty of Nursing, Chiang Mai University. Permission was obtained from each hospital for data collection. The Informed Consent Forms were received from all participants after informing them about the purposes and detail methods of the study and clarifications was made before data collection. All participants in the study had the right to stop or withdraw from the study at any time, and without any punishment or loss of benefits. The questionnaires did not have any sensitive or private information about the individuals. To assure the full protection of the human rights of the study participants, only a code number was used for each questionnaire during the whole processes of research. Finally, the data was kept confidential.

Data collection

The data collection was done after receiving ethical approval from the Research Ethics Committee of the Faculty of Nursing, Chiang Mai University, and permission for data collection from the People's Hospital of Lincang and the Second People's Hospital of Lincang. The participants were placed in a relatively private and quiet environment during completion of questionnaires. Demographic data and clinical information were recorded by the researcher based on the participants' medical records. The researcher read the questionnaires to each individual participant and filled in their responses on the questionnaires. Unhealthy weight (BMI ≥ 23 kg/m^2), low physical activity (<600 MET-minutes per week), as well as unhealthful dietary practices (STC score > 8), were determined.

Data analysis

The data was analyzed using SPSS 13.0 in English version. Quantitative data were expressed as frequency, percentage, means, and standard deviations. In addition, Pearson Chi-square and Fisher's Exact Test were used to test differences between groups.

Results

Table 1 Demographic characteristics of participants (n= 324)

Demographic Characteristics	Male (n=122)	Female (n=202)	Total (n=324)
	n%	n%	n%
Age (Male M=50.84 [SD 14.32]; Female M=49.15 [SD 13.56])			
Young Adult (18-39)	25 (20.49)	48 (23.76)	73 (22.53)
Middle Aged (40-59)	65 (53.28)	111 (54.95)	176 (54.32)
Older Adult (≥60)	32 (26.23)	4 3(21.29)	75 (23.15)
Family History of Gallstone			
Yes	34 (27.87)	61 (30.19)	95 (29.32)
No	88 (72.13)	141 (69.81)	229 (70.68)
Underlying Disease			
Diabetes	17 (13.93)	21 (10.40)	38 (11.73)
Hypertension	8 (6.56)	14 (6.93)	22 (6.79)
CHVI or Anemia or Liver cirrhosis	7 (5.74)	7 (3.46)	14 (4.32)
Previous treatment			
Gastrectomy History	12 (9.84)	14 (6.93)	26 (8.02)
Octreotide use	3 (2.46)	5 (2.48)	8 (2.47)

Note. CHVI= Chronic Hepatitis Virus Infection

In Table 1. Majority of them were females (202, 62.35%). The average age of males (M 50.84, SD 14.32) and females (M 49.15, SD 13.56) were quite similar. About half of them were in middle aged adults (40-59 years) (total 176, 54.32%; males 65, 53.28%; females 111, 54.95%). Most of them were 40 years old or more (total 251, 77.47%; males 97, 79.51%; females 154, 76.24%). Less than one third of the participants had family history of gallstone (total 95, 29.32%; males 34, 27.87%; females 61, 30.19%). Not many of them had diagnosis of diabetes (total 38, 11.73%; males 17, 13.93%; females 21, 10.40%), hypertension (total 22, 6.79%; males 8, 6.56%; females 14, 6.93%), nor CHVI or anemia or liver cirrhosis (total 14, 4.32%; males 7, 5.74%; females 7, 3.46%). In

terms of previous treatment, a few had history of gastrectomy (total 26, 8.02%; males 12, 9.84%; females 14, 6.93%) and Octreotide usage (total 8, 2.47%; males 3, 2.46%; females 5, 2.48%).

Table 2 Demographic characteristics of female participants (n = 202)

Demographic Characteristics	Female
	n%
Times of pregnancy	
0	19 (9.41)
1-2	100 (49.50)
≥3	83 (41.09)
Previous treatment	
Oral contraceptives	65 (32.18)
Hormone Replacement Therapy	23 (11.39)

In Table 2. Majority of them had pregnancy one time or more (1-2 times 100, 49.50%; ≥3 times 83, 41.09%). Less than one third of them had previous treatment of oral contraceptives (65, 32.18%) and hormone replacement therapy (23, 11.39%).

Table 3 Gallstone composition

Gallstone Composition	Male (n=34)	Female (n=35)	Total (n=69)
	n%	n%	n%
Cholesterol	24 (70.59)	22 (62.86)	46 (66.67)
Pigment and Mix	10 (29.41)	13 (37.14)	23 (33.33)

According to Table 3, only around one fifth of the removed gallstone had been investigated for their composition (total 69, 21.30%; males 34, 27.87%; females 35, 17.33%). Among these investigated gallstones, around two third were cholesterol gallstones (total 46, 66.67%; males 24, 70.59%; females 22, 62.86%).

Table 4 Factors related to gallstone formation among the participants (n = 324)

Factors Related to Gallstone Formation	Male (n=122)	Female (n=202)	Total (n=324)
	n%	n%	n%
Unhealthy weight (BMI≥23kg/m^2	90 (73.77%)	146 (72.28)	236 (72.84)
Low physical activity	87 (71.31%)	140 (69.31)	227 (70.06)
Unhealthy dietary practice	34 (27.87%)	66 (32.67)	100 (30.86)

As displayed in table 4, factors related to gallstone formation among the participants in this study: unhealthy weight (overweight to obesity) was found mostly (236, 72.84%), followed by low physical activity (227, 70.06%), and unhealthy dietary practice (100, 30.86%), respectively. Alike factors were found among males (90, 73.77%; 87, 71.31%; and 34, 27.87%, respectively) and females (146, 72.28%; 140, 69.31%; and 66, 32.67%, respectively).

Table 5 Frequency and percentage of factors related to gallstone formation among participants whose gallstones had been investigated (n = 69)

Factors Related to Gallstone Formation	Cholesterol Gallstone			x^2	p
	No (n=23)	Yes (n=46)	Total (n=69)		
	n (%)	n (%)	n (%)		
Unhealthy weight [a*]				5.73	.024*
Yes	15(65.22)	41(89.13)	56(81.16)		
No	8(34.78)	5(10.87)	13(18.84)		
Low Physical Activity [a]					
Yes	15(65.22)	35(76.09)	50(72.46)	.91	.25
No	8(34.78)	11(23.91)	19 (27.54		
Unhealthful dietary Practice [a*]					
Yes	21(91.30)	19(41.30)	40 (57.97)	7.70	.006*
No	2(8.70)	27(58.70)	29 (42.03)		

[a] Pearson Chi-square. [b] Fisher's Exact Test. * $p < 0.05$.

Among participants who had cholesterol gallstones (n=46), similar pattern of factors related to gallstone formation was found. Unhealthy weight was found as the highest (41, 89.13%), followed by low physical activity (35, 76.09%), and unhealthy dietary practice (19, 41.30%), respectively (Table 5).

Among those whose gallstone had investigated (n=69), the group that had cholesterol gallstones had statistically significant higher number of unhealthy weight participants, but lower number of unhealthy dietary practice participants than those who did not have (41 vs 15 and 19 vs 21, respectively) (p<.05) (Table 5). However, although the low physical activity was found higher among the participants who had cholesterol gallstones than those who did not have (35 vs 15), no statistically significantly difference was found (p > .05).

Discussion

In this study, majority of participants who came for gallstones removal were females (202, 62.35% vs 122, 37.65%). Confirming that women are almost twice as likely as men to form gallstones. The underlying mechanism is

female sex hormones, parity, oral contraceptive used, and estrogen replacement therapy are established risk factors for cholesterol gallstone formation, female sex hormones adversely influence hepatic bile secretion and gall-bladder function (Xu et al., 2012). It was found that females who participated in the study reported the usage of oral contraceptives and hormone replacement therapy of 32.18% and 11.39%, respectively. Moreover, most of them are at least 40 years old (251, 77.47%). Like what is known that the frequency of gallstones increases with age, escalating markedly after age 40 to become 4 to 10 times more likely in older individuals (Xu et al., 2012). Among those whose gallstones were investigated, around two third were cholesterol gallstones (46, 66.67%). Similar patterns were found among males (24, 70.59%) and females (22, 62.86%). These may be due to the changes in diet and lifestyle in the past century that linked to the increased prevalence of gallstones, especially cholesterol gallstone (Huang et al., 2010).

Unhealthy weight (overweight to obesity) was found mostly, followed by low physical activity, and unhealthy dietary practice, respectively among all participants as well as those who were males, females, and had cholesterol gallstones (Table 4 and 5). Possible explanation is as followings.

Most participants were unhealthy weight (236, 72.84%) (overweight [23-27.4 kg/m2] 134, 41.36% and obesity [≥27.5 kg/m2] 102, 31.48%). Among gallstones that had been investigated in this study (n=69), cholesterol gallstones were found mostly around two third (46, 66.67%). Unhealthy weight is a health disease which may be reason to cause gallstone formation in gallbladder. Humans with higher BMI are at highest risk to have gallstones in their gallbladder particularly in women (Bonfrate, Wang, Garruti, & Portincasa, 2014). As gallstone has been linked with the local distribution of fat. High central adiposity has been absolutely correlated with risk of gallstone disease (Zahra & Kaisrani, 2019). The relationship between unhealthy weight and gallstones is the linear increase of cholesterol production accompanied by the increase of fat deposition, resulting in the increased activity of rate-limiting enzyme of cholesterol synthesis, which can increase the synthesis of cholesterol in liver, and promote the supersaturation and secretion of cholesterol into the bile duct but inhibit the peristalsis of bile duct, thus contributing to the formation of gallstone (Bonfrate et al., 2014; Zahra & Kaisrani, 2019).

The result of this study was congruent with various studies. Stringer, Fraser, Gordon, Sharples, & Windsor (2013) found that one third of gallstone patients were obese (BMI ≥ 30kg/m2), but this figure varied among different ethnic groups, with 25% of Europeans, and 16% of Asians. Besides, BMI ≥ 25kg/m^2 was used to distinguish obesity group from normal group in the study of Xu et al. (2012) in Beijing province which 55.68% of gallstone patients were found obese. In addition, a large cohort study that confirmed linkage between increased BMI and increased risks of symptomatic gallstone disease (Stringer et al., 2013). Xu et al. (2012) also confirmed that the risks of gallstone formation in overweight, moderately obese, and

severely obese patients were 1.46, 1.83, and 3.10 times higher than that of normal weight or underweight.

It was found that two third of the participants has low physical activities (70.06%, males 71.31%, females 69.31%) (Table 4). The causes of low physical activity can be explained by the rapid urbanization and industrialization of Lincang city. Many people adopted city life and changed from labor occupations to more sedentary occupations. Similarity to other part of China, Lincang people spend more time on watching TV and computer usage, but less time engaging in physical activity than ever before. As revealed in some studies, it could be concluded that from 1991 to 2006, the average weekly physical activity of Chinese adults fell by 32 % (Song, Thisse, & Zhu, 2012).

In this study, low physical activity was found among majority of gallstone patients. It was consistent with most studies. For instance, the study of Ansari-Moghaddam, Khorram, Miri-Bonjar, Mohammadi, & Ansari (2016) and Bilal et al. (2016) that found low level of activity among gallstone patients of 85.00% and 67.78%, respectively. However, these studies did not clearly define cut-point for low physical activity. In addition, the study of Bila et al. (2016) revealed that percentage of low physical of activity was significantly higher than those who did not have gallstones.

Several biological mechanisms could be used to explain the relationship between low physical activity and gallstone formation. Low physical activity partly be responsible for decreasing bile salt excretion which is contributing to imbalance of salt-cholesterol percentage of which resulting in an increase in bile saturation index, decreased intestinal peristalsis and gallbladder hypomotility (Stokes et al., 2011). Vice versa, regular physical exercise can prevent gallstone formation by reducing bile stasis and plasma triglycerides and elevating high-density lipoprotein cholesterol levels which can lower biliary cholesterol saturation (Stokes et al., 2011).

In this study, the prevalence of unhealthful dietary practices among gallstone patients was found the least which was less than one third of the participants (30.86%, males 27.87%, females 32.67) (Table 4). Findings of this study were almost the same as those from several studies. Almost similar prevalence of unhealthy dietary practices was found among foreign studies; 35.0% from Iran study (Ansari-Moghaddam et al., 2016); 32.78% from South Pakistan study (Bilal et al., 2016).

According to the Nutrition Examination Survey of Yunnan province, the results revealed that in the 21st century, the consumption of animal fat and oil among Chinese people was growing rapidly, over around 70% of the recommended standard. The average intake of fat was increased by 52.8%, it has exceeded the reasonable range of 30% of total dietary fat energy recommended by WHO, and 30.2% of total energy came from fat, with an increase of 48.8% as compared to 1990s (Zhang et al., 2016). Even though, the consumption of fruits and vegetables, was higher than in 1990s but still fell far short of the recommended target, reaching only 20% to 30% (Zhang et al., 2016).

As according to epidemiology, gallstones are found more among people with increasing age (Xu et al., 2012). As reflecting from this study, the majority of participants in this study who were gallstone patients seeking of surgical procedure were the group of middle aged (40-59 years old) (176, 54.32%; males 65, 53.28%; females 111, 54.95%) and older adult (≥60 years old) (75, 23.15%; males 32, 26.23%; females 43, 21.29%). Older Chinese people still consumed traditional diet. Chinese food from Lincang City are noticeably light, less oily, and healthy.

As compared with other Chinese studies, percentage of gallstone patients who had unhealthy dietary practices from this study was found lower than that of Zhang & workmates (2020) done in Sichuang, which was 52.70%, respectively. Moreover, the study of Chen and colleagues (2014) in Taiwan, unhealthful dietary practices were found only 21.74%. It can be explained that the different eating habit and preference among people in different parts; for instance, in big cities, majority of people usually consumed regular diet rich in high-fat, high-calories while low in fiber (Zhang, He, Fu, & Deng, 2020), whereas Taiwanese people prefer higher intake of fruits and vegetables (Chen, Hsu, Liu, & Tung, 2014).

Comparing to elsewhere studies, prevalence of unhealthy dietary practices in this study was almost similar. Low prevalence of such practices was found in Iran study (Ansari-Moghaddam et al., 2016) and South Pakistan study (Bilal et al., 2016), which were 35.0%, 32.78%, respectively. Consuming diet containing high fat and calories but low in fruits and vegetables was regularly practice among participants in their daily life (Ansari-Moghaddam et al., 2016; Bilal et al., 2016).

Unhealthy dietary practices might not be the only risk of gallstone formation. Unhealthy weight (overweight and obese) is the confirmed antecedent of gallstone development. Therefore, unhealthy dietary practices and low physical activity which both are strong determinants of unhealthy weight (Wadden, Webb, Moran, & Bailer, 2012) should be carefully take into consideration. It was proved that high fat intake is the essential for the induction of gallstone, especially cholesterol gallstone. Excessive animal fat consumption lead to increasing fat deposits, with the production of cholesterol increases, leading to the formation of cholesterol-supersaturated bile, increasing the probability of stone formation (Stokes et al, 2011). In addition, low fiber intake contributes to increased blood cholesterol level through the impact on bile acid metabolism (Bonfrate et al., 2014). However, regardless of diet composition, the greater intake of total calories, the higher risk of gallstone formation, the absolute calorie intake is related to the relative mass of free cholesterol in bile, which is the most important variable in lithogenic bile formation (Stokes et al., 2011). Moreover, higher calories intake and low physical activity greatly contribute to an increased BMI which is considered an unhealthy weight.

Conclusion

Results from this study confirmed high prevalence of unhealthy weight, low physical

activity, and unhealthful dietary practices among Chinese gallstone patients in Lincang City, Yunnan Province, the PRC.

Application of research findings

The results of this study can be used to guide risk factor screening and determining the high-risk group of gallstone formation in Lincang City, Yunnan Province, the People's Republic of China. Specific preventive measures and follow-up plan should be developed for them. In addition, public education can be made for people in this area to raise the awareness and guidelines for prevention of gallstone can be developed through keeping healthy weight, engaging in moderate to high level of physical activity, and consuming healthy food.

Conclusions and recommendations

The test of effectiveness of nursing intervention for the high-risk group to keep healthy weight, regular moderate to high physical activity, and enhance healthy dietary behaviors should be constructed. Moreover, prospective study to follow up the prevalence of gallstone formation among these participants should be carried out to test for its effectiveness.

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