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Introduction

The Journal of Southeast Asian Medical Research is a peer-reviewed journal with printing every 6 months. The main goal of this collaboration project is to distribute new knowledge in medical sciences to medical communities and scientists, as well as encouraging scientific collaborations within Southeast Asia and also other nations around the world. The journal publishes original research in the medical sciences: clinical and basic. We welcome original articles from across the world. The editorial board consists of international experts in various fields of medicine, ranging from internal medicine to a variety of surgeries. The full text of the journal is available online at http://www.jseamed.org

It is our aim to publish the most up-to-date and useful research information in medical sciences. In Southeast Asia, there are some unique problems in health care and diseases, such as tropical diseases, and it is crucial that health professionals can access, share and exchange knowledge promptly. In this region, there is still a gap of knowledge in health sciences that needs to be closed by scientific research, which we are hoping to close after this collaboration project. We hope that the journal will fulfill the objectives and will provide benefit to all, both medical practitioners and researchers alike.

Editorial board

CONTENTS

A.Original Article

EFFECTIVENESS OF EARLY BALANCE EXERCISES ON TOTAL HIP ARTHROPLASTY

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Abstract

Backgroud: Patients receiving total hip arthroplasty (THA) without a rehabilitation program could develop functional limitation within one year after surgery. Exercise for balance control is critical for mobility, physical function and prevention of falls. Few studies have investigated the effectiveness of balance training among THA patients.

Objective: The study aimed to investigate the effectiveness of early balance exercises on THA.

Methods: This study was a randomized control study for 30 patients undergoing unilateral THA. The postoperative rehabilitation program was started at the second postoperative day for every patient. All the postoperative patients were randomly assigned and equally allocated to balance and conventional groups. Patients in the balance group received typical exercises and balance exercises while those in the conventional group received typical exercises alone. Assessments were taken at postoperative day 2 (baseline) and week 5 using Berg Balance Scale for balance and Timed Up and Go Test for ambulatory function. The differences between the two groups were analyzed.

Results: Statistically significant improvements were noted at the end of treatment by all outcome measures in both groups ($p<0.05$). However, the balance group showed better improvement in all outcome measures than the conventional group after the intervention period ($p<0.05$).

Conclusion: Early balance exercises added to typical exercises were more effective than conventional exercises in terms of improving balance and ambulatory function among patients with THA.

Keywords : Early balance exercises, Total hip arthroplasty

Introduction

Total hip arthroplasty (THA) is one of the most common and successful surgical procedures widely used to treat of end stage joint disease, relieving pain, providing functional recovery and improving hip joint stability and quality of life.[1, 2] Over one million of THA are performed yearly worldwide and is anticipated to double within the next decade.[3]

The most common reason for THA is the presence of severe pain with functional limitation[2] especially, among patients presenting osteoarthritis, rheumatoid arthritis, avascular necrosis, traumatic arthritis, hip fractures, benign and malignant bone tumors.[4] Impaired balance, muscle weakness, decreased range of motion and diminished functional mobility are common problems exhibited after THA. [5] After THA, the ability to perform activities of daily living generally improves, but some functional limitations such as impairment in postural balance and walking ability may still persist.[6]

Patients receiving THA without a rehabilitation program will develop functional limitation within one year after surgery.[7] Long lasting impairments were found to be reduced regarding balance control after THA so exercise for balance control is critical for mobility, physical function and prevention of falls.[8] Therefore, adequate and timely postdischarge physiotherapy is very important to restore a patient's physical function and quality of life.[9, 10] Impairment in balance is a major cause of falls. Up to 30% reduced muscle strength has been found after THA.[11] Early and persistent loss of muscle function and impaired balance after THA have increased risk of falling within the first months of this surgery.[11] Falls are most frequent during the early discharge period, with 24.1% occurring within the first week and 51.8% within the first month.[5] Ikutomo et al. stated that 42.9% of THA patients had experience of fall within the early postoperative period after THA, while Jorgensen and Kehlet reported 25% of patient experienced a fall within two years after THA.[12,13]

After falling, potential complications such as fractures and other injuries, as well as more lasting effects, disability and fear of falling can occur.[11] Thus, intensive physiotherapy in the early postoperative phase may be indicated as a rationale to reduce balance impairment and

muscle weakness to lower surgery-related falls.[11] Moreover, early weight bearing after THA reduces the bone demineralization from decreased weight bearing and provides earlier recovery of functional mobility.[5]

Trudelle-Jackson and Smith stated that an exercise program emphasizing weight bearing and balance exercises significantly improved muscle strength, balance and self-perceived function among patients undergoing THA.[14] Jogi et al. investigated balance exercises in addition to typical joint range of motion and muscle strengthening exercises in the acute postoperative phase following THA. The study reported a five-week intervention period resulted in significantly greater improvements in balance and functional mobility compared with a typical postoperative physical therapy program alone.[13]

Few studies have investigated the effectiveness of balance training among THA patients. However, the balance exercises were not started as early as postoperatively. Furthermore, evidence is lacking regarding the effectiveness of early balance exercises in THA. The purpose of this study was to compare the effectiveness of early balance exercises plus typical exercises and typical exercises alone among THA patients.

Methods

Study design and settings

The study employed a hospital-based randomized control design. Thirty patients with total hip arthroplasty from the Mandalay Orthopaedic Hospital, Mandalay, Myanmar were included according to selection criteria. The study period was from May 2017 to August 2018. All patients were explained thoroughly about the study and signed a written informed consent form to participate. Ethics approval was obtained from Ethics Review Committee of the University of Medical Technology, Mandalay, Myanmar.

Inclusion and exclusion criteria

Patients aged more than 18 years and unilateral cases of THA were included in the study. Exclusion criteria included pain with weight bearing on unaffected extremities and patients presenting postoperative complications such as deep vein thrombosis and surgical

site infection within the study period.

Intervention/Procedure

Patients meeting the eligibility criteria were randomly assigned to conventional (n=15) and balance groups (n=15) using block randomization. Patients in both groups received typical exercises but early balance exercises were included only in the balance group.

Typical exercises included in this study were isometric quadriceps and glutei, ankle pumps, active assisted hip and knee flexion and extension, active assisted hip abduction, short arc quads, active hip flexion, active hip extension, active hip abduction, active knee flexion and active knee extension exercises.

All the patients in the balance group were given early balance exercises and typical exercises. From postoperative day 2 to postoperative day 7, patients in the balance group started weight shifting exercises. From postoperative week 2 to week 5, forward knee lunge, trunk rotation and heel raise exercises were included. All the patients in both groups were allowed to perform each exercise for ten times per session, three sessions per day for five weeks duration. Initially, exercises were properly demonstrated to the patients and caregivers by the researcher. After dicharge, all patients were provided with pamphlets including written exercises and photographs. And

then, checking was conducted once a week by the researcher regarding whether the patients could perform exercises properly and correctly. The intervention period was five weeks.

Assessment

Outcomes were assessed using the Berg Balance Scale (BBS) and Timed Up and Go Test (TUG) at postoperative day 2 (baseline) and at the end of week 5. BBS was used to assess the static and dynamic balance and TUG was used to assess the patient's ambulatory function.[15, 16]

Statistical Analysis

Data were analyzed using STATA Statistics Software, Version 13.0. To compare demographic data betweengroups, the two sample t-test and chi-square test were used. Intragroup analysis of each group was performed using the paired t-test to determine the changes in mean output variables. Intergroup analysis was performed using the two sample t-test. The results were considered statistically significant when p-value was less than 0.05.

Results

The baseline demographic characteristics of the 30 patients showed no statistically significant difference as shown in **Table1**.

Table1. Demographic characteristics of the patients in both groups

Variables		Conventional group	Balance group	p-value
Age (Mean year, SD)		47.3 (15)	39 (11.7)	0.10
Sex	Male	7	6	0.71
	Female	8	9	
Side of operation	Left	5	8	0.269
	Right	10	7	
Reasons for surgery	Osteoarthritis	3	2	0.85
	Avascular necrosis	8	9	
	Fractures	2	1	
	Others	2	3	

Baseline scores of the Berg Balance Scale and Timed Up and Go test in the balance group and conventional group also did not differ significantly (p = 0.76 and 0.15, respectively). However, scores of the Berg Balance Scale and Timed Up and Go Test significantly improved after treatment in both groups. After completing the 5-week treatment, a more significant improvement in Berg Balance Scale (**Fig. 1**) and Timed Up and Go Test scores (**Fig. 2**) was noted in the balance than the conventional group.
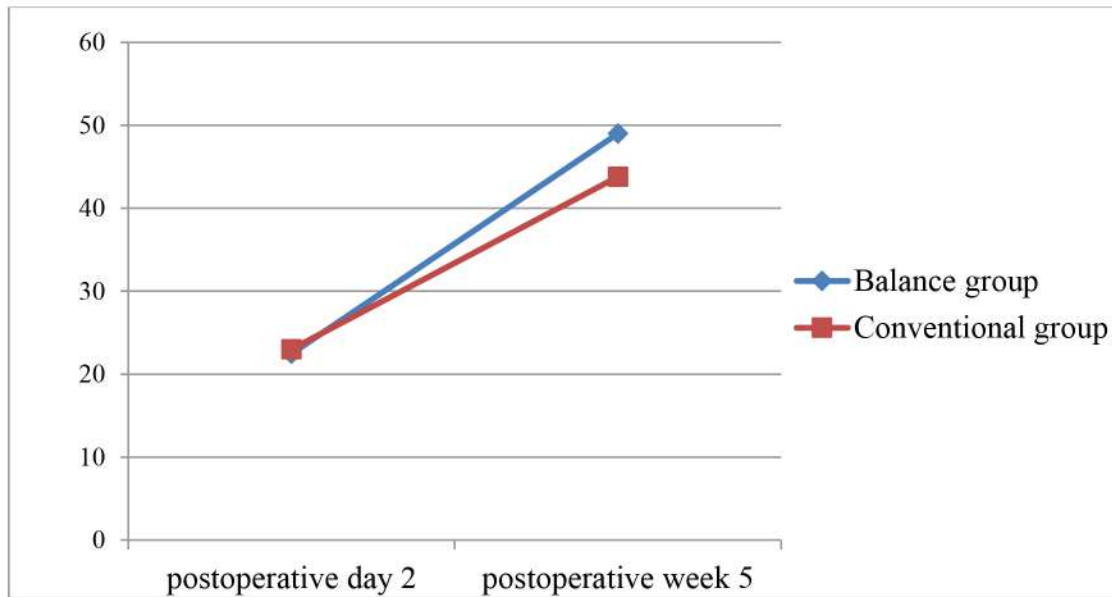

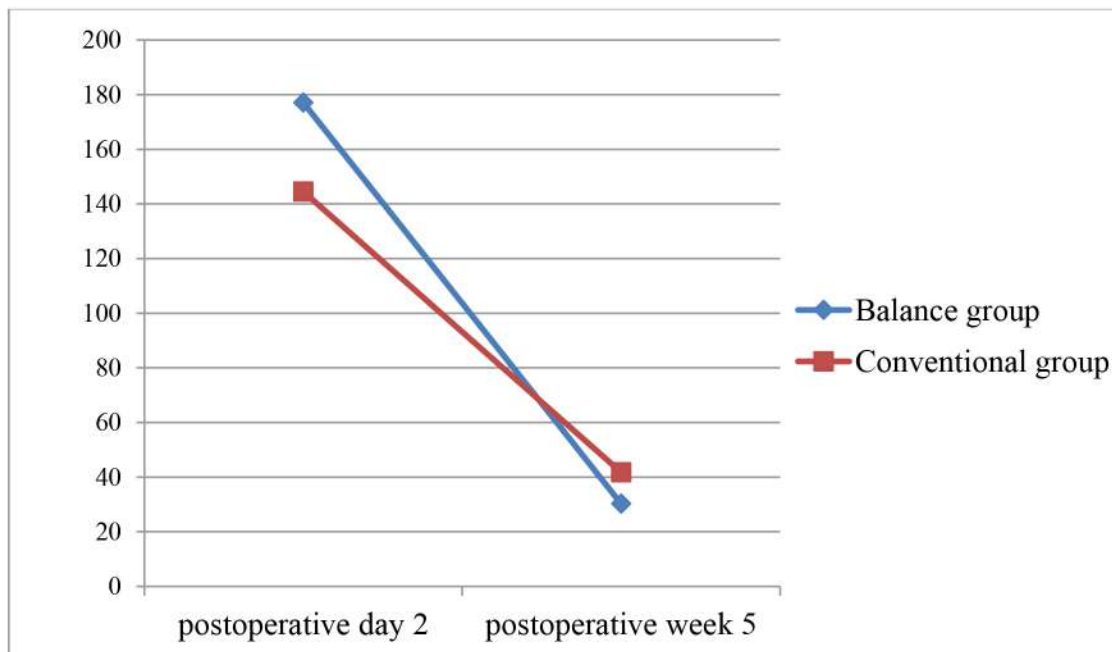**Figure 1.** Comparison of Berg Balance Scale scores between two groups

Figure 2. Comparison of Timed Up and Go Test scores between two groups

Table 2. Showing pre-intervention and postintervention of Berg Balance Scale and Timed Up and Go Test scores of both groups

Variables	Treatment	Conventional group mean ± SD	Balance group mean ± SD	p-value
Berg Balance	postoperative day 2	23 ± 5.04	22.47 ± 4.29	0.76
Scale	postoperative week 5	43.8 ± 3.9	49 ± 3.74	0.0009
	p-value	<0.0001	<0.0001	
Timed Up and	postoperative day 2	144.4 ± 63.42	177.07 ± 57.86	0.15
Go test	postoperative week 5	41.73 ± 9.82	30.2 ± 11.54	0.0064
	p-value	<0.0001	<0.0001	

Discussion

The present study showed the balance group improved in balance and ambulatory function among patients with THA than that of those in the conventional group. Jogi et al. (2015) reported greater improved balance measures such as Timed Up and Go Test (TUG) scores and Berg Balance Scale (BBS) was observed in the balance group after 5-week intervention following balance exercises in THA patients. However, no significant differences were observed in both study groups concerning the WOMAC-function and Activities-specific Balance Confidence (ABC) Scale.[13] The present study proved early balance exercises had a positive impact on balance control and ambulatory function in terms of BBS and TUG after the 5 week intervention. The main difference between Jogi et al. (2015) and this study involved the type of balance exercises and commencement of balance exercises after THA. The present study started the balance exercises earlier than the Jogi et al. study.

A randomized controlled trial of Liao et al. (2013) evaluated the effects of balance training on functional outcomes after total knee replacement among patients with knee osteoarthritis including 58 patients in an experimental group and 55 patients in a control group. Improved balance control was found in the experimental group after the eight-week intervention. They concluded that balance exercises had a significant benefit on mobility and functions of patients with knee osteoarthritis after total knee replacement.[15] Similar improvement in balance and mobility function was observed after balance training in related studies of other health conditions.

A study by Madureira et al. conducted a 12-month randomized controlled trial of balance training among elderly women with osteoporosis in 2010 reporting the long-term balance training program provided improved balance, reduced in risk of fall and benefitted overall health quality of life.[17] Smania et al. (2010) evaluated the effect of balance training concerning postural instability among patients with idiopathic Parkinson's disease and concluded that such training had a positive effect on balance control at the end of treatment and that improvement was maintained at one-month follow-up.[18] Sparrow et al. (2016) reported a highly challenging balance program for three months was effective in reducing fall rate and improving balance control among patients with Parkinson disease.[19] The randomized controlled trial of Monticone et al. (2017) observed balance task-specific training had a beneficial effect on balance,

physical function and quality of life among patients with hip fracture patients compared with general physiotherapy after three-week intervention.[20]

Limitations of this study included the small sample size, lack of blinding system, and lack of long term follow-up. Further studies should be conducted using a larger sample size, different outcome parameters and long term follow-up period to determine maintenance effects of intervention to patients. Different patient populations needing improve balance and ambulatory function should also be enrolled.

Conclusion

The present study concluded that typical exercises including balance exercises are better than typical exercises in terms of balance and ambulatory function. Thus, significantly improved balance and ambulatory function could be obtained with early balance exercises included in typical exercises among patients with THA.

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RADIOLOGIC PREDICTIVE FACTORS FOR CUT OUT FAILURE OF PROXIMAL FEMORAL NAIL ANTI-ROTATION IN TREATMENT OF INTERTROCHANTERIC FRACTURES

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Abstract

Background: Proximal femoral fractures are the most common type of fracture among elderly patients. Moreover, half of the fractures are unstable types (AO 31A2-A3). The aim of surgical treatments of these fractures is to achieve stable fracture fixation allowing early weight bearing and returning to pre-fracture functional status. Even though the Tip Apex Distance (TAD) less than 25 mm has been used to identify the appropriate position of the lag screw, little data has demonstrated the optimized TAD using a helical blade.

Objectives: The study aimed to identify radiologic factors influencing fixation failure using a newly designed Proximal Femoral Nail Anti-rotation (PFNA).

Methods: A total of 400 cases of low energy intertrochanteric fractures undergoing PFNA fixation were reviewed. Of these, 10 cases of fixation failure were further investigated determining the exact cause. Of 390 patients with successful outcomes treated using PFNA fixation, 20 cases were randomized as a control group. A comparative study was conducted between those with fixation failure group and control group.

Results: The displacement in lateral view and sum of displacement between AP and lateral view of radiographs were noted to have significant differences between the groups ($p=0.002$ and 0.015). No significant differences were found between the groups in terms of Neck Shaft Angle (NSA) and Tip Apex Distance (TAD) including migration of the PFNA blade in the Cleveland zone. Additionally, the cutoff point was determined as less than 0.91 using the sum of the distance of displacement of AP with specificity of 95% and sensitivity of 80%. Moreover, the lateral view of the radiographs was less than 1.42 with specificity of 80% and sensitivity of 80%.

Conclusion: This study demonstrated that the displacement in lateral hip view and sum of the displacement in both AP and lateral hip view were alternative parameters measured to decrease failure rate in PFNA. These parameters may be useful as an alternative to decrease the mechanical failure of PFNA fixation.

Keywords : Intertrochanteric fractures, Proximal Femoral Nail Anti-rotation fixation, Radiologic factors, Fixation failure

Introduction

Proximal femoral fractures are the most common type of fracture among elderly patients. Moreover, one half of the fractures comprise unstable types (AO 31A2-A3).[1] The aim of surgical treatments of these fractures is to achieve stable fracture fixation allowing early weight bearing and returning to pre-fracture functional status.[2] Many different devices have been developed but implant failure still occurred. No extramedullary or intramedullary device has definitely been proved preferable.[3] However, cephalomedullary nail fixation may be advantageous when compared with extramedullary devices.[4]

The most common mode of fixation failure is cutting out the lag screw from the femoral head. Tip apex distance (TAD) is the most valuable factor in determining the risk of lag screw cutting out, with an established distance of less than 25 mm from the edge of femoral head.[5, 6] The proximal femoral nail anti-rotation (PFNA) has been designed by AO [4], which has been changed from a lag screw to a helical blade for better purchasing in the femoral head to decrease rate of cutting out failure.[4-5]

In addition to TAD, other factors determine fixation failure such as the screw position and achieving screw position in the center-center position.[5, 7, 8, 11] In the early studies, cutting out failure was reported, ranging from 8 to 23%, while awareness of TAD and position of screw fixation were able to help reduce this failure rate to 1.6 to 3%. [11]

Even though TAD less than 25 mm [13] has been used as a good position of the lag screw[5], little data has demonstrated the optimized TAD using a helical blade. In addition, current data has not clearly defined the factors determining implant failure using the helical blade. Therefore, the objectives of our study were to identify radiologic factors influencing fixation failure with a newly designed PFNA.

Methods

After obtaining IRB approval (IRB ID #R095q/58_Exp), a cohort of consecutive adult patients with low energy intertrochanteric fracture treated using PFNA fixation were retrospectively reviewed from radiographs and medicalcharts at a single institution between January 2012 and December 2016.

Hip fracture patients were excluded when they sustained high energy trauma, polytrauma, pathologic fracture and ballistic injury. Patients followed-up less than one year were excluded from the study. A total of 400 cases of low energy intertrochanteric fractures undergoing PFNA fixation were reviewed. Failed fixation cases were selected to review in the study. Finally, ten cases of fixation failure were further investigated to determine the exact cause of those failures. The inclusion criteria for the control group were adult patients who sustained low energy fracture treated with PFNA. Therefore, 20 cases from 390 patients with successful outcomes treated with PFNA fixation were randomized as the control group using a computer program. A comparative study was conducted between the fixation failure group and control group. Demographic data and comorbidities were collected in both groups, and fracture patterns were both classified based on AO/OTA classification. All patients were identified for clinical and radiological outcomes at 3, 6, and 12 months. We investigated causes of mechanical failure with the following parameters: quality of reduction (neck-shaft angle, displacement between cortices of proximal and distal fragments in AP and lateral view), TAD and helical blade position using the Cleveland zone.

Operative procedure

Fracture fixation was performed by titanium PFNATM nail (Synthes). All patients were placed on the fracture table in the supine position. Closed reduction was fluoroscopically performed under regional or general anesthesia. After anatomical reduction was achieved, a guidewire was inserted in the tip of the greater trochanter. After that, proximal reaming was performed. Then, the diameter of the nail was measured under fluoroscopy. The proximal femoral nail was applied into the medullary canal while the guidewire was removed. Before applying a helical blade in the femoral head, a guidewire was inserted in the femoral head to measure the exact position and length of the helical blade using AP and lateral projection of the fluoroscopic view. We further applied the helical blade in the femoral head. Then tightened it as the final step.

Postoperative management

Proper pain control was performed in all patients, and they were allowed to have weight bearing as tolerated, deep vein thrombosis prophylaxis performing mechanical pumping was applied to all patients during hospital admission.

Outcome measurement

All patients were followed up in a clinic at 6 weeks, 3 months, 6 months and 1 year. Radiographic measurements were taken by two trained orthopedic surgeons and a radiologist who did not participate in the operative field and mean measurements were calculated. Antero-posterior (AP) and lateral radiographs were assessed using PACS Software. They were also used to evaluate the helical blade position including the Cleveland zone position of the helical blade (using a custom-designed template system), TAD, NSA, quality of fracture reduction, implant failure and loss of reduction. All parameters were evaluated to identify the exact cause of fixation failure.

Statistical analysis

Demographic data was recorded for each patient and analyzed using STATA. Group comparisons for continuous variables were analyzed using a two-sample independent t test and Chi-square analysis was used to determine differences between categorical variables. Receiver Operating Characteristic (ROC) curves (generated by logistic regression) was performed using SAS Software (Version 9.3, SAS Institute, Inc., Cary, North Carolina, USA) to determine cut off point of significant factors. Statistical significance was defined as $p < 0.05$.

Results

Ten patients with fixation failure, treated with PFNAs in the study were identified, while 20 patients were randomly selected as a control group. The average age of successful fixation and fixation failure were 78 (59 to 88) and 78.5 (61 to 87), respectively. The most common OTA/OA classification was 31A1 in both groups. No differences were observed between groups in terms of demographic data as demonstrated in **Table 1**. Significant differences were noted on distance of displacement (**Table 2**). The displacement in lateral view and sum of displacement of AP and lateral view of radiographs were noted to exhibit significant differences between groups ($p = 0.002$ and 0.015, respectively). No significant differences were found between groups in terms of NSA and TAD (**Table 2**) including the migration of the PFNA blade in the Cleveland zone. Additionally, a cutoff point was determined at 0.91 cm using the distance of displacement of the lateral view of the radiographs with specificity of 95% and sensitivity of 80%. The sum of distance of displacement in AP and lateral view of the radiographs was at 1.42 cm with specificity of 80% and sensitivity of 80%.

Table 1: Demographic data of enrolled participants

	Fixation failure cases (study group) n = 10	Successful fixation cases (control group) n = 20	*p*-value
Sex			
Male	4(40)	8(40)	1.000
Female	6(60)	12(60)	
Mean age	78(59-88)	78.5(61-87)	0.948
AO classification			
1	5(50)	10(50)	1.000
2	3(30)	6(30)	
3	2(20)	4(20)	
Side			
1	4(40)	9(45)	0.794
2	6(60)	11(55)	

Table 2: Radiographic analysis

	Fixation failure cases (study group) n = 10	Sucessful fixation cases (control group) n = 20	p-value
Cleveland zone			0.835
1	0(0)	1(5)	
2	1(10)	3(15)	
4	2(20)	3(15)	
5	3(30)	9(45)	
6	3(30)	3(15)	
8	1(10)	1(5)	
Neck Shaft Angle (NSA)	134.5(120-153)	134(122-153)	0.846
Tip Apex Distance (TAD)	3(2-4)	2.5(2-5)	0.198
Displacement in AP view (cm.)	1.08(0-3.84)	0.41(0-3)	0.143
Displacement in lateral view (cm.)	1.28(0-2.43)	0.49(0-1.57)	0.002*
Sum of displacement (cm.)	2.23(0-5.95)	0.85(0.3-3)	0.015*
Difference migration	-0.68(-3.23-1.4)	-0.09(-0.5-0.31)	0.231
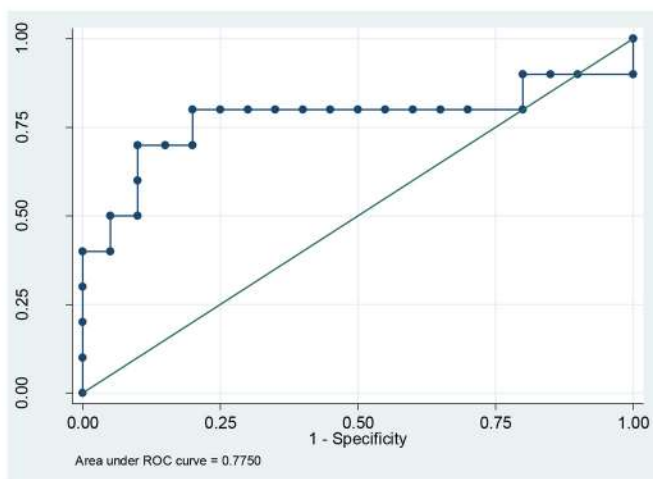
Fig 1: The ROC curve of displacement measured by affected hip in the lateral view
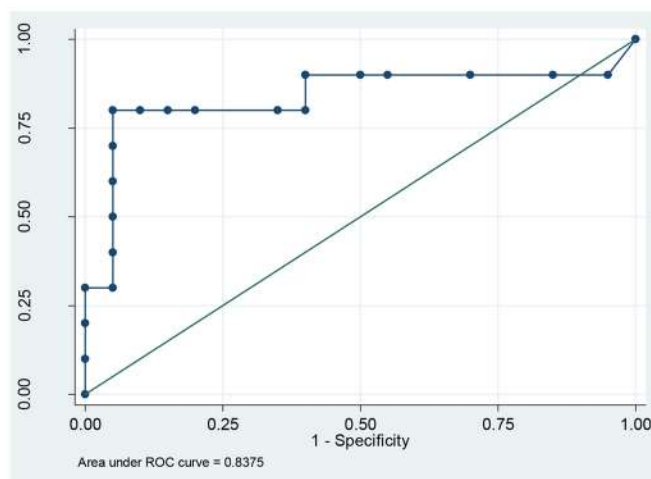
Fig 2: The ROC curve of displacement measured by summation of affected hip in the AP and lateral view

Discussion

Intertrochanteric fractures are common in elderly populations,[14] and reducing complications when performing operations hip fractures is important. The complication rate of proximal femoral nail and related necessity of revision procedure varies from 3 to 28% in the literature.[1, 2, 4, 5]

Simmermacher et al.[5] reported an overall technical failure rate of 4.6% among 191 fractures. Helical blades, forcibly impacted in the cancellous bone,[19] reduced the risk of cut out; however, they were less resistant to cut through. Appelt et al.[20] demonstrated a complication rate of 15.2% (n=27) in the study of 178 patients. Fogagnolo et al.[21] found mechanical failures up to 23.4% among patients (n=11) in case series including 47 peritrochanteric fractures. Domingo et al.[22] demonstrated that ten patients (3.3%) requiring a revision procedure were AO type 2 and type 3 fractures. Similarly, Simmermacher et al. concluded that PFN-related complications were mostly associated with AO type 2 fractures.

Previously, we commonly used a dynamic hip screw (DHS) for intertrochanteric fractures' fixation. TAD was a significant impact factor to predict failure fixation on that fixation. Baumgartner et al.[6] reported the ideal position of the lag screw should be in the center-center position of AP and lateral views of radiographs. Currently, PFNA is a newly designed implant used for fixation of intertrochanteric fractures. In addition, it presents more advantages than DHS for many reasons such as decreasing blood loss, reducing duration of surgery producing earlier weight bearing and mobilization, reducing hospital stay and decreasing risk of infection.[5,11,12,15,16,17,18] Andrej N et al.[7] demonstrated that TAD could be applied to use as a predictive factor for PFNAs' fixation failure. However, they suggested that TAD ranging from 20 to 30 mm should be applied as an appropriate position of the blade, which was not as close as that of Baumgartner's study. Additionally, they found that zone of distribution of the blade was not a significant factor, similar to our study. Semmi et al.[15] found that 14 of 152 patients (9.2%) undergoing osteosynthesis of intertrochanteric fractures finally underwent a revision procedure from mechanical complications, suggesting that the quality of fracture reduction was an important factor resulting in a revision

procedure. Similarly, J.J. Liu et al.[16] revealed that 9 failures of 308 patients with intertrochanteric fracture using PFNA. They found that faulty operative procedures, unsatisfactory reductions, serious osteoporosis and incorrect positioning of the helical blade were important factors responsible for failed internal fixation. Ashok et al. reported that implant positioning, fracture reduction and a good learning curve were mandatory for successful outcomes.[12] Our study demonstrated that the distance between proximal and distal fragments of fractures in the lateral view and sum of displacement of AP and lateral views were important factors to predict implant failure. Surgeons usually use an intraoperative image intensifier to check the quality of reduction creating an easy method to evaluate NSA in the AP hip view.[4,7,8,10,15] However, evaluating quality of reduction in hip lateral view is quite difficult. According to J.J. Liu et al.[16], they determined the quality of reduction using NSA in AP hip view. Therefore, the quality of reduction in the AP hip view should be performed in a good position. Therefore, our hypothesis was that poor quality of reduction in the AP view should constitute a failure cause, but the statistical analysis in the study lacked significance. According to the ROC curve in our study, we found the optimal summation of displacement in AP and lateral hip views. When the sum of displacement of AP and lateral views was below 1.42 cm, we could predict to successful outcomes with a sensitivity of 80% and specificity of 80%. Similarly, when the displacement in lateral view was below than 0.91 cm with sensitivity of 80% and specificity of 95%, we could forecast a successful outcome also. The study had several limitations. One limitation was that this comprised a retrospective case control study. Thus, the final outcomes depended on what was recorded in the medical charts. In addition, important demographic data such as BMD, BMI and pre-injury status were unrecorded, which might have constituted significant factors of fixation failure. Another limitation was that the study enrolled a small sample size which could not represent all intertrochanteric fractures' of patients. Moreover, our study population was mainly categorized as AO A1 (50%) and A2 (30%) in both groups. This was why the displacement in AP view lacked

significance between the groups. A larger sample size may have exposed some parameters changing the significance.

Conclusion

This study demonstrated that the displacement in lateral hip view and sum of the displacement in both AP and lateral hip views constituted alternative parameters to help decrease failure rate of intertrochanteric fracture using PFNA. Therefore, the optimal displacement of distance should not be more than 0.91 cm in the lateral view and sum of distance of displacement should not be more than 1.42 cm in both views. These parameters may be useful as optional parameters to help guide surgeons to achieve high quality reductions in the operating room so that their constructs will decrease mechanical failure from PFNA fixation.

Picture 1. Applied Cleveland zone in the study, customized template for evaluating the tip of blade placement
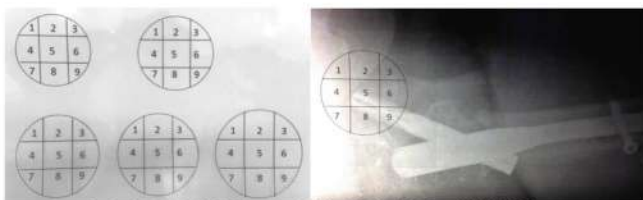
Picture 2. Different blade migrations, the correct size template and measured distance between center of circle to tip of blade at postoperative film and follow-up or failure film

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PREVALENCE OFABNORMAL GLUCOSE METABOLISM AMONG THAI OVERWEIGHT AND OBESE CHILDREN AND ADOLESCENTS

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Abstract

Background: The prevalence of childhood obesity is increasingly worldwide. Abnormal glucose metabolism (AGM) including impaired fasting glucose (IFG), impaired glucose tolerance (IGT) and type 2 diabetes (T2DM) is a common endocrine complication among overweight and obese children and adolescents. Few studies of AGM are available in Thailand.

Objectives: The study aimed to establish the prevalence of AGM and identify associated complications among overweight and obese children and adolescents.

Methods: Data of overweight and obese children and adolescents, aged 6 to 18 years, undergoing oral glucose tolerance test (OGTT) at Phramongkutklao Hospital were reviewed retrospectively. Fasting blood sugar, Hemoglobin A1c (HbA1c), fasting insulin, triglyceride, high-density lipoprotein, low-density lipoprotein, aspartate transaminase and alanine aminotransferase were derived from fasting measurement. Homeostatic model assessment was calculated to represent the insulin resistance.

Result: A total of 204 children and adolescents (122 males) were included. Mean age was 12.1 ± 2.6 years and percent weight for height was $168.8 \pm 25.4\%$. The overall prevalence of AGM was 20.6%, 1% had T2DM, 0.5% had IFG, 36% had IGT and 1.5% had combined IFG/IGT. Among the AGM, IGT was the most frequent subtype representing 92.8% (39/42 cases) but only 2 cases of T2DM were diagnosed in our study. The AGM group had significantly higher FPG ($p=0.034$), HbA1c ($p=0.006$) and cholesterol levels ($p=0.043$) than those of the nonabnormal glucose metabolism (NGM) group.

Conclusion: Prevalences of AGM among overweight and obese children and adolescents were high. IGT was the most frequent subtype of AGM.

Keywords : Impaired glucose tolerance, Impaired fasting glucose, Type 2 diabetes, Insulin resistance

Introduction

The prevalence of obesity among children and adolescents is increasingly worldwide.[1] One recent study showed the prevalence of overweight and obesity among children and adolescents aged 5 to 19 years has risen dramatically from 4% in 1975 to over 18% in 2016.[2] Being obese is a major risk factor leading children to have many chronic diseases such as type 2 diabetes (T2DM), nonalcoholic fatty liver disease (NAFLD), coronary artery disease, stroke, obstructive sleep apnea, chronic kidney disease and psychiatric disorders.[3-5] Abnormal glucose metabolism (AGM) is a group of abnormal high blood glucose conditions including impaired fasting glucose (IFG), impaired glucose tolerance (IGT) and T2DM. This condition is the most common endocrine complication among overweight and obese children and adolescents. The mechanism of AGM results from increased proinflammatory cytokines production from excessive adiposity leading to impaired insulin signaling and insulin resistance (IR) secondary to pancreatic beta cell dysfunction.[5] At the initial stage of IR, the plasma glucose level will be higher than normal but lower than the diagnostic criteria of diabetes resulting in IFG and IGT, also called, "prediabetic phase".[6] When the IR progresses further, obese children will develop T2DM. Thus, identifying this critical phase in obese youth is important to prevent diabetes in the future.[7] To diagnose AGM, the American Diabetic Association (ADA) suggests that fasting plasma glucose (FPG), 2-h plasma glucose (PG) during a 75-g oral glucose tolerance test (OGTT) and A1C can be used to test for prediabetes or diabetes among children and adolescents who have specific risk factors [8,9] but related studies have shown that 2-h PG during a 75-g OGTT is superior to FPG in predicting AGM because the most frequent type of AGM is IGT.[10-13] Few studies of AGM are available in Thailand. The aims of our study were to determine the prevalence of AGM and identify associated complications among overweight and obese children and adolescents in our population.

Methods

Subjects

All overweight and obese children aged 6 to 18 years visiting the outpatient department (OPD) or admitted in Phramongkutklao Hospital and undergoing OGTT between January 2002 and December 2016 were included in our study and the details of medical history were reviewed. Subjects who had underlying diseases including syndromic obesity, endocrine disorders (growth hormone deficiency, hypothyroidism, Cushing syndrome), abnormal CNS (brain tumor, surgery), steroid use and incomplete data were excluded. All procedures were in accordance with the ethics standards of the Institutional Review Board, Royal Thai Army Medical Department.

Study design

The data of all subjects were retrospectively reviewed from medical records including weight, height, blood pressure and results of blood tests on the day of OGTT. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared and BMI z-scores were calculated to compare values across different ages and sex.[14] Percent weight for height (PWH) was calculated by weight in kilograms divided by median age for height for children15 then multiplied by 100. Children with PWH from 120 to 140, >140 to 200 and >200% were classified as overweight, obese and morbidly obese, respectively.[14] Hypertension was classified according to age using systolic blood pressure or diastolic blood pressure. Elevated BP, stage 1 hypertension and stage 2 hypertension were classified as BP ≥90th to <95th percentile or 120/80 mm Hg to <95th percentile (whichever is lower), ≥95th to <95th percentile +12 mmHg or 130/80 to 139/89 mm Hg (whichever is lower) and ≥95th percentile +12 mm Hg or ≥140/90 mm Hg (whichever is lower), respectively, in children aged 1 to <13 years. among children aged >13 years, elevated BP, stage 1 and stage 2 hypertension were classified as BP 120/<80 to 129/<80 mm Hg, 130/80 to 139/89 mm Hg and ≥140/90 mm Hg, respectively.[16] The standard OGTT was performed in the early morning after 12-hr overnight fasting using 1.75 gm/kg of glucose up to a maximum of 75 gm. Blood samples of plasma glucose and insulin were obtained at baseline and every 30 min for 120 min after an oral glucose load. Serum insulin, A1C, total cholesterol (TC), triglyceride (TG), high-density lipoprotein (HDL),

low-density lipoprotein (LDL), aspartate transaminase (AST) and alanine transaminase (ALT) were obtained once at baseline. Prediabetes was defined by two parameters, IFG and IGT. IFG was diagnosed when fasting glucose level was 100 to 126 mg/dL while IGT was diagnosed when 2-h PG during a 75-g OGTT was 140 to 200 mg/dL. T2DM was diagnosed when FPG was >126 mg/dL.[8] High TG, high LDL and low HDL were defined at the level of ≥150, ≥100 to 130 (depending on age group) and <40 mg/dL.[17,18] Dyslipidemia was diagnosed when one case of high TG, high LDL or low HDL was evidenced. NAFLD was diagnosed by the presence of persistently elevated levels of ALT more than 2 fold from the age and sex specific cutoff values.[14] IR was calculated by the homeostatic model assessment (HOMA score) for which a score >3 was considered IR.[19]

Statistical analysis

Continuous variables are shown as means and SD. Categorical variables are reported as number (percentage) of participants with the characteristics of interest. Between-group comparisons were performed by ANOVA for continuous variables. All statistical analyses were performed using the SPSS, Version 24.

Results

Between January 2002 and December 2016, OGTT was performed among 265 overweight or obese children and adolescents. Sixty-one were excluded because 7 had syndromic obesity, 12 had endocrine disorders, 8 had abnormal CNS, 5 had steroid use and 29 had incomplete data. Thus, a total of 204 subjects were included in our study and 122 (59.8%) were male. Mean age, BMI Z-score and PWH were 12.1 ± 2.6 years, 2.2 ± 0.3 and 168.8 ± 25.4%, respectively. Of them, 25 (12.2%) were classified as "overweight", 158 (77.5%) were "obese" and 21 (10.3%) were "morbidly obese". Health-related complications including hypertension, dyslipidemia and NAFLD were found in 41.2, 47.8 and 10.5% of cases, respectively. Sixty-one subjects (29.9%) had stage 1 hypertension and 23 (11.3%) had stage 2 hypertension. Baseline biochemical data of overweight and obese children and adolescents are shown in **Table 1**. A total of 114/200 patients (57%) had IR defined as HOMA-IR score >3.

Table 1. Biochemical studies of overweight and obese children and adolescents.

Characteristics	Mean ± SD
FPG (mg/dL)	80.2 ± 9.5
2-h PG during 75-g OGTT (mg/dL)	122.6 ± 26.2
A1C (%)	5.5 ± 0.4
Fasting insulin (μU/ml)	21.7 ± 15.3
HOMA-IR	4.3 ± 3.1
Triglycerides (mg/dL)	115.8 ± 74.4
Total cholesterol (mg/dL)	178.6 ± 33.5
LDL (mg/dL)	115.1 ± 31.4
HDL (mg/dL)	47.4 ± 11.1
AST (IU/l)	26.9 ± 20.2
ALT (IU/l)	34.6 ± 41.3

FPG; Fasting plasma glucose, LDL; low-density lipoprotein (LDL), HDL; high-density lipoprotein, AST; aspatate transaminase, ALT; alanine transaminase

The prevalence of AGM was 20.6% (42/204 cases). The prevalence of IFG, IGT, combined IFG/IGT and T2DM was 0.5, 17.6, 1.5 and 1%, respectively (**Fig. 1**). IGT was the most frequent subtype of AGM, representing 92.8% (39/42 cases) in the AGM group; 36 with IGT and 3 with combined IFG/IGT. IFG was found in 9.5% (4/42 cases), 1 had IFG alone and 3 had combined IFG/IGT. T2DM was diagnosed in 2 cases; 1 was diagnosed by FPG >126 mg/dL with IGT and 1 was diagnosed by 2-h PG during 75-g OGTT >200 mg/dL but normal FPG. One case was diagnosed with IFG without IGT.

Comparing between the NGM and AGM groups (Table 2), degrees of obesity defined by BMI Z-score and PWH did not significantly differ between groups. According to the possible influence of pubertal status on glucose metabolism, overweight/obese children and adolescents with AGM had older age compared with the NGM group (13.0 ± 2.5 vs. 11.8 ± 2.6, $p= 0.01$). Subjects in the AGM group also had significantly higher FPG (85.2 ± 15.4 vs. 79.8 ± 7.0, $p =0.034$), A1C (5.7 ± 0.4 vs. 5.5 ± 0.4, $p=0.006$) and cholesterol (188.1 ± 36.9 vs. 176.2 ± 32.2, $p=0.043$) than the NGM group. Other biochemistries including TG, LDL, HDL, AST, ALT, fasting insulin and HOMA-IR did not significantly differ in both groups.

Table 2. Characteristics and biochemical studies between normal and abnormal glucose metabolism

| Parameters	NGM (N = 162)	AGM (N = 42)	p-value
M/F	99/64	23/18	
	(61/39%)	(56/44%)	
Age (years)	11.8 ± 2.6	13.0 ± 2.5	0.01
BMI z-score	2.3 ± 0.3	2.2 ± 0.4	0.14
PWH (%)	169.2 ± 23.2	167.1 ± 33.2	0.72
Hypertension			
Stage 1	50 (30.7%)	11 (26.8%)	
Stage 2	19 (11.7%)	4 (9.8%)	
FPG (mg/dL)	79.8 ± 7.0	85.2 ± 15.4	0.03
A1C (%)	5.5 ± 0.4	5.7 ± 0.4	0.01
Fasting insulin (μU/mL)	21.2 ± 15.4	23.6 ± 15.3	0.37
HOMA-IR	4.0 ± 2.9	5.0 ± 3.5	0.07
Triglyceride (mg/dL)	108.7 ± 56.0	143.6 ± 113.3	0.06
Cholesterol (mg/dL)	176.2 ± 32.2	188.1 ± 36.9	0.04
LDL (mg/dL)	113.8 ± 29.1	120.4 ± 39.1	0.23
HDL (mg/dL)	48.0 ± 11.1	44.7 ± 10.9	0.09
AST (U/L)	25.9 ± 17.1	30.8 ± 29.2	0.16
ALT (U/L)	31.6 ± 34.7	46.2 ± 59.9	0.15
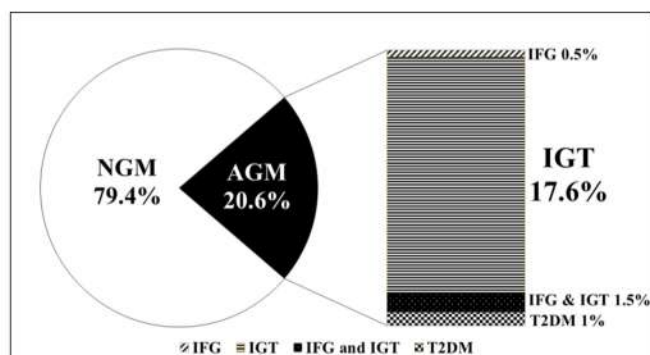
Figure 1. OGTT in 204 subjects and prevalence of abnormal glucose metabolism

Discussion

In our study, the overall prevalence of abnormal glucose metabolism (IFG, IGT, combined IFG/IGT and T2DM) among overweight and obese children and adolescents was 20.6%, comparable to related studies in Thailand [20] and Asian countries.[21-24] IGT is the most frequent subtype of AGM similar to reports from other studies worldwide [13, 20-26] (**Table 3**). The prevalence of IGT was 17.6%, similar to the related report in 2016 by Jaruratanasirikul S who showed the prevalence of IGT in southern Thailand was 15.3% [20] and also comparable with others countries in the Middle East and Asia such as Israel [21], Turkey [22], Bangladesh [23] and India [24] for which the prevalence of IGT ranged from 13 to 18% but lower than that in the United States (25%) [25] (**Table 3**). Interestingly, the IGT prevalence in our study was twice as high whereas the prevalence of IFG was significantly lower than that reported from European cohort studies such as in Italy [12, 27] and Sweden [28] (**Table 3**). The severity of obesity, average BMI and BMI z-score of the subjects included in those studies did not differ from our study, so this observation could be explained by differences in ethnicity but the exact reason remains unclear.

Table 3. Prevalence of abnormal glucose metabolism in overweight and obese children and adolescents

Authors	Year	N	Age (years)	Prevalence of AGM			
				IFG (%)	IGT (%)	T2DM (%)	Combine IFG/IGT(%)
Sinha R [25]	2002	167	4-18	-	25	4	-
Shalitin S [21]	2005	192	5-22	-	13.5	0.5	-
Atabek ME [22]	2007	196	7-18	6.6	18	-	-
Cambuli VM [12]	2009	535	7-14	7.66	3.2	0.2	-
Maffeis C [26]	2010	536	4-17	-	6.9	0.1	-
Brufani C [13]	2010	510	3-18	0.8	10	0.4	1.2
Panamonta O [29]	2010	186	10-15	1.1	-	2.2	-
Mohsin F [23]	2012	161	6-18	-	16.9	2.1	-
Ek AE [28]	2015	134	11-17	35.8	6	0	14.2
Bonito PD [27]	2017	3088	7-15	3.3	3.8	0	0.3
Jaruratanasirikul S [20]	2016	177	9-14	-	15.3	2.3	-
Choudhary K [24]	2017	180	10-18	-	13.9	0.5	-
This study	**2019**	**204**	**6-18**	**0.5**	**17.6**	**1.0**	**1.5**

Silent T2DM was rarely diagnosed among asymptomatic overweight and obese children and adolescents. [12,13, 21, 23-29] In our study, T2DM was diagnosed in 1 case by 2-h PG during 75-g OGTT with normal FPG and another case by FPG criteria. All of our results emphasized that 2-h PG during 75-g OGTT is a sensitive method to detect AGM compared with FPG and FPG alone is not a good parameter to detect silent T2DM.[25]

Concerning obesity complications, excessive adipocyte in obesity leads to several metabolic and physiological effects. In our study, we found a high prevalence of dyslipidemia and the most prevalence involved high LDL level. Dyslipidemia was explained by increased hydrolysis of triglycerides from excessive fat tissue.[3,30,31] In the liver, liposomes in hepatocytes increase in size (steatosis) then form large vacuoles that are accompanied by a series of pathological stages including nonalcoholic fatty liver disease, steatohepatitis and cirrhosis.[3] In our study, 10.5% of our population had steatohepatitis due to elevated ALT level but we were unable to perform liver ultrasound to confirm this condition. We also found hypertension (stage 1 or 2) in 41.2% of subjects. This could be explained by chronic overactivity of the sympathetic nervous system in some patients with obesity by mechanical stress of fat tissue that caused renal compression and resulted in systemic hypertension.[3, 30, 31]

Between groups, AGM has significantly older age, higher FPG, A1C and cholesterol compared with NGM. Age is one of the most important factors associated with AGM, and a similar result was noted by Brufani et al., who showed the frequency of IGT appeared to increase gradually from Tanner stage I to III to IV (4.1 vs. 19.9% in Tanner stage I vs. III to IV).[13] This phenomenon was explained by the transient increase of IR observed throughout puberty[31,32] and this result was consistent with the recommendation from the ADA in which prediabetes or diabetes should be screened among asymptomatic overweight and obese children who are older than 10 years or have entered puberty.[8,9] FPG and A1C were significantly higher in the AGM group. For FPG, this finding was expected because subjects with IFG were classified in the AGM group and this finding was similar to many studies from European and the United States cohorts. [10, 21, 34, 35]

Subjects in the AGM group had higher TG, TC, LDL and lower HDL level but only TC significantly differed between groups. Many studies have reported that TG was significantly associated with IGT [12, 21, 25, 36] but the study from Groot et al. showed TG, TC, LHL and HDL were unassociated with IGT.[34] Because controversy exists among studies, more sample size should be included to identify these factors. Our study limitation is that the data was derived from subjects attending an outpatient clinic or admission thus not fully representative of a population-based sample and small sample size.

In summary, we found the high prevalence of AGM in overweight and obese children and adolescents. Of them, IGT showed highest prevalence but only 2 T2DM cases were detected. Subjects with AGM had significantly older age, higher FPG, HbA1c and TC. Moreover, the prevalences of obesity complications such as dyslipidemia, nonalcoholic fatty liver disease and hypertension were high in our study. This could activate our awareness on metabolic syndrome among overweight and obese children in our population.

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CORRELATION OF LIVER STIFFNESS IN CHRONIC LIVER DISEASES BETWEEN FIBROSCAN AND 2D SHEAR WAVE ELASTOGRAPHY IN PHRAMONGKUTKLAO HOSPITAL

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Abstract

Background: Noninvasive assessment of liver stiffness has been increasingly used to evaluate fibrosis instead of liver biopsy among patients with chronic liver diseases. FibroScan has been widely used as an alternative tool to assess liver stiffness. Several studies have shown significant correlation between the performance in staging liver fibrosis using 2D shear wave elastography (2D-SWE) technique, FibroScan method and the histological analysis of liver biopsy. The information using 2D-SWE is not well established in Thailand because this rather new technology can be obtained using high-end ultrasound machines.

Objective: The study aimed to evaluate the correlation of liver stiffness in chronic liver diseases obtained by the 2D-SWE method and a reference standard method, FibroScan.

Methods: A prospective observational study was conducted between March and December 2018. A total of 30 consecutive participants aged 18-80 years having chronic liver diseases were enrolled. Liver stiffness (LS) was evaluated in the same session using two elastographic methods: FibroScan (transient elastography) and 2D-SWE techniques. The conventional 2D ultrasound of the liver was also performed simultaneously. The assessment of fibrosis is described below: significant fibrosis (F >2), advanced fibrosis (F>3) and cirrhosis (F=4). The cut off values were 6.6, 9.4 and 11.2 kPa, respectively.

Results: Moderate to strong positive correlations were observed between measurements obtained by FibroScan and 2D-SWE in all stages of liver fibrosis (r= 0.66, *p* < 0.01) especially in fibrosis stages 2-3.

Conclusion: The 2D-SWE technique could be another alternative tool to evaluate liver fibrosis especially during the main targeted early stages for further medical therapeutic prevention of liver stiffness progression. This 2D-SWE may be added in routine sonographic studies in particular cases of chronic liver disease.

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Introduction

Cirrhosis is the 8th leading cause of death in Thailand. The Thai Association for the study of the liver has reported that cirrhosis is caused by inflammation or other harmful effects on the liver. Many causes of liver fibrosis include alcoholism, chronic hepatitis B, chronic hepatitis C, autoimmune hepatitis, bile duct obstruction and fatty liver disease. [1]

The mild degree of liver fibrosis and early stage of cirrhosis can be completely asymptomatic. Thus, the timely diagnosis of liver fibrosis has an important value in treatment and prognostic assessment of chronic liver diseases. The standard tool to assess the severity for pretreatment planning is liver biopsy. However, this involves an invasive procedure that can result in complications including death. Presently, due to the development of noninvasive methods and their high accuracy, the number of liver biopsies has decreased.

These noninvasive techniques comprise multiparameter blood tests (FibroTest) including haptoglobin, bilirubin, GGT, apolipoprotein A-I and alpha2 macroglobulin; radiographic examinations such as transient elastography (TE) (FibroScan) and magnetic resonance elastography (MRE). In addition interest has increased in acoustic radiation force impulse imaging and ultrasound in the imaging program, 2D shear wave elastography (2D-SWE).[2] Several studies have reported that the measurements of liver stiffness by 2D-SWE significantly correlated with the measurement by FibroScan and liver biopsy. [3, 4, 9, 10] In addition, 2D-SWE allows more area of screening, up to 20 cm[3] (7 cm).

All patients with chronic liver diseases received TE (FibroScan) at the Division of Gastroenterology and Hepatology, Department of Internal Medicine, Phramongkutklao Hospital to assess of liver fibrosis. They were also screened for liver tumors at the Department of Radiology using ultrasound on the upper abdomen. The process was costly and time-consuming for the patient to complete at multiple appointments. Therefore, we were interested to study whether 2D-SWE could be performed with accuracy at the time of performing conventional ultrasound. Thus, there would be no need to change tools, location or staff for the inspection. The aim of this study was to evaluate the diagnostic performance of the 2D-SWE using FibroScan as the reference method.

Methods

This study employed a prospective observational design approved by the Ethics Committee, Institutional Review Board, Royal Thai Army Medical Department (R217h/60). All subjects signed informed consent forms to undergo elastographic measurement. All patients with chronic liver disease aged from 18 to 80 years who had undergone TE (FibroScan) between March 2018 and December 2018 were included. Patients presenting a history of hepatocellular carcinoma, other hepatic tumors, hepatobiliary disease, liver transplantation or poor performance status were excluded.

Transient elastography (TE)

TE was performed in all subjects under fasting conditions using a FibroScan device (Echosens 502 Touch). Each patient was placed in the supine position using the right intercostal approach (around the 4th to 5th rib), right arm in maximal abduction using the M probe (standard frequency 3.5 MHz). The median value of ten valid liver stiffness (LS) measurements was calculated and the results were shown in kilopascals (kPa) (**Fig. 1**). To discriminate between various stages of fibrosis, the cut off values were used according to Metavir score of TE (FibroScan) [4,11-13] which differ in each disease status of the patients. The hepatic steatosis measurement was used from the study of Sasso et al. as the reference. [7] Because TE is a validated method for liver fibrosis evaluation, it served as the reference method to compare with the performance of 2D SWE.

Shear wave elastography (SWE)

2D SWE was performed using a Toshiba Aplio 500 system. All fasting patients were placed in the supine position with right arm maximal abduction. The probe was placed using the intercostal approach on the right chest wall to assess the right hepatic lobe. The patients held their breath for 5 to 10 seconds before the examiner pushed the acoustic pulse using the sample box size 3x3 cm (**Fig. 2**) and placed it 1 to 2 cm below the liver capsule. Ten regions of interest (ROI) measurements were taken in circular and 1 cm in diameter. The median value of ten consecutive measurements
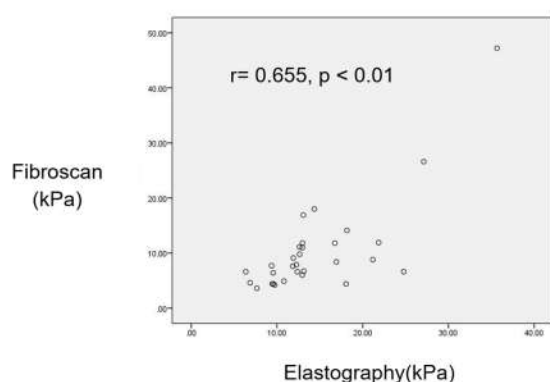
Figure 1. The correlation between FibroScan and elastography data

was used for statistical analysis, and the results were shown in kilopascals (kPa) and meters per second (m/s). The assessment of fibrosis is described below: significant fibrosis (F >2), advanced fibrosis (F>3) and cirrhosis (F=4). The cut off values of 6.6, 9.4 and 11.2 kPa, respectively, were used according to the study of Ferraioli et al.[5] Conventional ultrasound of the liver was also performed using the same ultrasound equipment (Toshiba Aplio500 system). All fasting patients were placed in the supine position. The cirrhotic ultrasound characteristics were investigated including the right hepatic lobe and/or the medial segment of the left lobe

atrophy, the lateral segment of the left hepatic lobe hypertrophy, increased caudate to the right lobe ratio (>0.65), increased distance of the gallbladder fossa, coarse heterogeneous liver parenchymal echo, evidence of portal hypertension and ascites. The ultrasound findings of fatty change were also recorded including increased liver echogenicity, obscuring of the hepatic and portal veins walls and impaired evaluation of the deep liver parenchyma and diaphragm.[6] Statistical analysis All data was analyzed using IBM SPSS statistics, Version 22.0 for Windows. Normal distribution was checked using the Kolmogorov-Smirnov test. All data on continuous variables were presented as mean, standard deviation (SD) or median and interquartile range (IQR). The correlation between FibroScan and elastography data were represented in Spearman's rank correlation coefficients. The sensitivity, specificity, positive predictive value and negative predictive value were calculated, and a p-value less than 0.05 was considered statistically significant. Results Thirty participants were evaluated for liver stiffness by means of TE and 2D-SWE among patients with viral hepatitis B (6 cases), viral hepatitis C (17 cases) and nonalcoholic steatohepatitis (NASH) (7 cases) as shown in **Table 1**.

Table 1. Demographic data of enrolled participants (N=30)

Characteristics	Number
Sex	
Male	21
Female	9
Underlying diseases	
Hepatitis B	6
Hepatitis C	17
NASH	7
Alcoholism	0
Steatosis stage from fibroScan	
(Control attenuated attenuation parameter,dB/m)	
Stage 0	15
Stage 1	2
Stage 2	6
Stage 3	7
Age (years, mean±SD)	49.6 ± 11.65 (28-72)*
BMI (Kg/m², mean±SD)	25.3 ± 3.76 (18.5-32.4)*

BMI =Body mass index, NASH= non alcoholic steatohepatitis

*(Min-Max)

Stage of fibrosis was obtained from 2D-SWE of which 2 individuals were at stage 2, 6 were at stage 3 and 22 were at stage 4 (**Table2**). Moderate to strong positive correlation was observed among liver stiffness values (kPa) assessed by means of FibroScan and by 2D-SWE (Spearman's rank correlation coefficient = 0.66, $p < 0.01$) as shown in **Fig. 1**. Almost one half (13/30) were categorized as FibroScan stage 1. Another 5, 6 and 6 participants were categorized as stage 2, 3 and 4, respectively. The correlation between liver stiffness values obtained from FibroScan and

2D-SWE at each stage is shown in **Table 2**. The best correlation between the two methods was observed in fibrosis stage 2 ($r = 0.9$, $p = 0.03$) and stage 3 ($r = 0.83$, $p = 0.04$). Additionally, most patients in the group of strong correlation had normal BMI ($r = .76$, $p = 0.049$).

The 2D-ultrasound appearances at each fibrosis stage using FibroScan are shown in **Table 3** whereas the fatty change appearance from 2D ultrasound at each fibrosis stage using the 2D-SWE is shown in **Table 4**.

Table 2. Fibrosis staging and correlation of liver stiffness values by FibroScan and 2D-shear wave elastography

	Number of participants			
Fibrosis stage	Fibroscan	2D-SWE	Spearman's rank correlation coefficient (r)	p-value
Mild /no fibrosis (F<2)	13	0	0.34	0.25
Significant fibrosis (F2)	5	2	0.90	0.03
Advanced fibrosis (F3)	6	6	0.83	0.04
Liver cirrhosis (F4)	6	22	0.54	0.27
Total	30	30		

Table 3. Ultrasound characteristics in each fibrosis stage using FibroScan

Fibrosis stage	Normal	Coarse parenchyma	Nodular contour	Increased caudate to right lobe ratio	Lateral segment hypertrophy	Mild steatosis	Moderate steatosis
0/1	2	8	3	0	0	3	4
1/2	1	3	1	0	0	2	1
2/3	3	3	3	0	1	1	1
3/4	2	3	1	0	1	0	2

Table 4. The fatty change appearance from 2D ultrasound in each fibrosis stage from 2D-shear wave elastography

Fibrosis stage From 2D-SWE	No steatosis	Mild steatosis	Moderate steatosis
1	0	0	0
2	1	0	1
3	2	2	2
4	13	3	6

Discussion

To our knowledge, limited numbers of studies in Thailand have evaluated the correlation between transient elastography, 2D-SWE and ultrasound characteristics of the liver in different stages of fibrosis. In this study, the correlation rate between transient elastography and 2D-SWE stiffness data was moderate to strong positive ($r = 0.66$, $p = 0.01$) in all chronic liver diseases for which fibrosis stage 2 and 3 revealed the most significant strong correlation ($r = 0.9$, $p = 0.03$ and $r = 0.83$, $p = 0.042$, respectively). The results of this study were similar to the related study of Bende et al.[7] showing a strong correlation ($r = 0.83$) between liver stiffness value assessed by means of TE and by 2D-SWE. Thus, we could use 2D-SWE as an alternative tool to assess liver stiffness.

The advantage of 2D-SWE compared with TE is that the technique is guided by B-mode imaging using a color-coded map. The operator can choose where to place the ROIs in which LS is measured in the most homogeneous area, and can use the color homogeneity as a qualitative criterion for the evaluation. It also allows avoiding large vessels and placing the measuring box far enough from the liver capsule to avoid interference with the liver capsule and subcutaneous fat. In addition, 2D-SWE also provides are larger ROI than TE.

After using BMI for subgroup analysis, the best correlation between TE and 2D-SWE was in the group having normal BMI ($r = 0.76$, $p = 0.049$). The result was similar to the study of Bende et al. [8] which reported the
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reliability of LS measurement depended on BMI.

The comparison between 2D-sonographic characteristics of cirrhotic change and degree of liver stiffness using TE showed that nine patients had cirrhotic appearance. Four participants (44.4%) were categorized having early fibrosis stage (F1-2) and five participants (55.6%) were categorized having severe fibrosis. These results might imply that the cirrhotic appearance from 2D-ultrasound may not be the only good criterion to represent severe degree of liver stiffness.

In this study, moderate correlation was observed between FibroScan and 2D-SWE in fibrosis stage 4, which might be due to a confounding factor such as fatty infiltration of the liver. The statistical analysis showed the liver stiffness data (kPa) tended to increase in high grades of hepatic steatosis (S0 = 13.94 ± 5.71, S1 = 15.02 ± 8.52, S2 = 15.21 ± 2.63) and 9 of 22 patients presenting severe fibrosis (stage 4) using 2D-SWE showed fatty liver. Thus, further study of the relationship between abnormal high liver stiffness data (kPa) among patients with fatty liver would be interesting.

In conclusion, 2D-SWE could serve as another alternative tool to detect early stages of liver stiffness (stages 2 to 3), which constitute the main targeted stages for further medical therapeutic prevention of liver stiffness progression. This 2D-SWE may be added in the routine sonographic study of particular cases of chronic liver disease.

Potential conflicts of interest

The authors declare they have no conflict of interest.

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PREVALENCE AND ASSOCIATED RISK FACTORS OF SUBSTANCE ABUSE AMONG ADOLESCENTS IN RURAL COMMUNITIES, CENTRAL THAILAND: A CROSS-SECTIONAL STUDY

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Abstract

Background: Substance abuse is one serious social challenge that has continued to increase over a long time. This major problem currently affects society, the economy and national development. One related study conducted in southern Thailand found that the prevalence of substance abuse in youth groups was 7% in 2002 increasing to 9% and 13% in 2003 and 2004, respectively. Nevertheless, information regarding substance abuse among adolescents in Thailand remains limited especially in remote rural communities. The study aimed to determine the prevalence and associated factors concerning substance abuse.

Methods: The present study was conducted in 2 high schools in rural communities, Chachoengsao and Sa Kaeo Provinces, central Thailand. A cross-sectional quantitative study identified the prevalence and associated factors of substance abuse among adolescents. A standardized self-reported questionnaire was used to collect data including demographic characteristics, history of substance abuse and associated factors. Multivariate analysis was performed to adjust confounders using logistic regression analysis.

Results: The sample size of the study totaled 652 adolescents. The lifetime prevalence of substance abuse was 24.4%, while the one-year prevalence of substance abuse was 16.7%. After adjusting for potential confounders, the risk factors associated with one year substance abuse among adolescents were being male (AORs; 2.19, 95%CI; 1.16–4.16), friend inducement (AORs; 3.28, 95%CI; 1.64–6.55), smoking (AORs; 3.22, 95%CI; 1.50–6.90) and alcohol consumption (AORs; 4.46, 95%CI; 2.43–8.16).

Conclusion: Our data emphasized that substance abuse was a problem in these rural communities. Public health interventions aimed to prevent substance abuse among adolescents should be designed and provided for these rural communities. Further, schools should provide lessons how to negotiate and avoid coercion when being induced to abuse substances or other unhealthy and dangerous behaviors.

Keywords : Substance abuse, adolescents, rural community, Thailand

Introduction

Substance abuse represents one serious social challenge that has continued to increase over a long time. It constitutes one of the major problems currently affecting society, the economy and national development.[1, 2] Moreover, illicit drugs affect several aspects among users including emotional, social, physical and mental health.[3, 4] Because all drugs directly affect the brain, using highly addictive drugs many consecutive times will eventually lead to addiction. Importantly, drug addiction leads to many complications including psychosis, depression and aggressive behaviors.[5, 6] At present, the Thai government provides a great deal of funding and other resources to manage drug problems. The government has used both internal and collaborative efforts with the awareness that narcotics may contribute to social problems such as crime, prostitution and gambling. These problems threaten national security, public order, moral practices and the economy. However, substance abuse is still escalating among adolescents. One related study in southern Thailand found that the prevalence of substance abuse in youth groups was 7% in 2002 increasing to 9% and 13% in 2003 and 2004, respectively.[7]

One half of areas in Thailand are still rural (47%) where healthcare provider characteristics and health literacy differ from those of urban communities especially in remote rural areas.[8] Nevertheless, information regarding substance abuse among adolescents in Thailand remains limited especially in remote rural communities. Additionally, adolescents constitute a teenage population who will grow up to become adults soon. However, these young people are more likely to become addicted to illegal substances due to developmental changes in the neural circuitry involved in reward processing.[9] This study aimed to determine the prevalence and associated risk factors of substance abuse among adolescents in remote rural communities in central Thailand. When substance issues of adolescents are detected and solved early on, the complications of addiction may be attenuated.

Methods

The present study was conducted in two high schools in rural communities, Chachoengsao and Sa Kaeo Provinces, central Thailand, 160 km east of Bangkok. This remote, isolated community totaled 15,000 villagers, mostly farmers. Schools no.1 and no.2 are government high schools providing education in grades 7 to 12 for adolescents residing in peripheral areas of schools. Both schools were chosen to represent schools in remote rural communities in central Thailand. A cross-sectional quantitative study identified the prevalence and associated factors of substance abuse among adolescents. The survey was conducted among 451 students in school no. 1 and 201 students in school no. 2. A standardized self-reported questionnaire was used to collect data including demographic characteristics, history of substance abuse and associated factors. The questionnaires were self-administered and delivered in an envelope. However, names and identities of the volunteers in the study were kept confidential. We checked the collected data using double-data entry for accuracy and completeness and then coded, entered and analyzed the data using IBM SPSS Statistics for Windows, Version 23.0. Frequency distribution of demographic characteristics and behavioral data were calculated to determine descriptive statistics of the sample. Chi-square test was used to compare frequency distribution of categorical variables by strata, while binary logistic regression analysis was used to determine the risk factors associated with substance abuse. The magnitude of association was presented as crude odds ratios (ORs) with 95% confidence interval (CI). A p-value less than 0.05 was considered statistically significant. Multivariate analysis was performed to adjust confounders using logistic regression analysis using the backward elimination method (Wald).

This study was reviewed and approved by the Institutional Review Board, Royal Thai Army Medical Department. Consent forms were completed by the main guardian of each adolescent and adolescents before they participated in the study.

Results

The sample size of the study totaled 652 adolescents. The response rate of schools no.1 and no.2 accounted for 75.2% and 71.0%, respectively. Descriptive characteristics of the study sample are presented in **Table 1**. In all, 451 (69.2%) students were from school no.1 in Chacheongsao

Table1. Demographic characteristics of the enrolled school children

Characteristics	n	(%)
Age (years)		
mean ± S.D.		14.87±1.70
min-max		12-19
School		
No. 1	451	(69.2)
No. 2	201	(30.8)
Sex		
Male	270	(41.7)
Female	378	(58.3)
Grade		
7th	125	(19.2)
8th	142	(21.8)
9th	122	(18.7)
10th	89	(13.7)
11th	106	(16.3)
12th	68	(10.4)
Religion		
Buddhism	641	(98.3)
Christian	9	(1.4)
Others	2	(0.3)
History of school suspension		
No	620	96.9
Yes	20	3.1
History of parents being called by teacher		
No	608	(95.3)
Yes	30	(4.7)
Family income per year (baht)		
<50000	80	(51)
≥50000	77	(49)
GPA 1st semester 2017		
mean ± S.D.		2.82±0.62
GPA 2016		
mean ± S.D.		2.84±0.67

and 201 (30.8%) students were from school no. 2 in Sa Kaeo. In all, male participants accounted for 41.7%. The average age of participants was 14.8±1.7 years.

The lifetime prevalence of substance abuse was 24.4%. The one-year prevalence of substance abuse was 16.7% with a higher prevalence noted among males (24.1%) than females (11.6%). **Figure 1** shows the prevalence of substances abuse among adolescents in rural communities stratified by type of substance. Cannabis was the most commonly abused substance on a lifetime basis accounting for 4.4%. Univariate and multivariate logistic regression analyses were performed to determine the factors associated with one year substance abuse as shown in **Tables 2 and 3.** After adjusting for potential confounders, the risk factors associated with one year substance abuse among adolescents included being male (adjusted odds ratio (AORs); 2.19, 95%CI; 1.16–4.16), friend inducement (AORs; 3.28, 95%CI; 1.64–6.55), smoking (AORs; 3.22, 95%CI; 1.50–6.90) and alcohol consumption (AORs; 4.46, 95%CI; 2.43–8.16).

Discussion

The lifetime prevalence of substance abuse among adolescents in the present study was 24.4%, which was relatively high compared with one related study in southern Thailand.[7] A recent study conducted among high school years 7, 9 and 11 and vocational students to determine the situation of substance abuse among adolescents in both urban and rural areas in southern Thailand showed an overall lifetime prevalence of illicit drug use accounting for 5 to 7%.[7] Another study in four regions of Thailand conducted between 2001 and 2011 reported the lifetime prevalence of illicit drug use accounted for 5.4 to 7.3%.[10] Additionally, one recent report in 2015 illustrated that the lifetime prevalence of substance use among adolescent students was 12.7%.[11]

Obviously, the trend in the lifetime prevalence of substance use continuously rose overtime. The study found that the one year prevalence of substance abuse among adolescents in rural Thailand was 16.7%. Compared with one year prevalence of substance abuse among adolescents in our study, the one year prevalence of those in one related study in 2004 was relatively low.[7]

Fig 1. Prevalence of substance use among adolescents in the rural communities stratified by type of substance
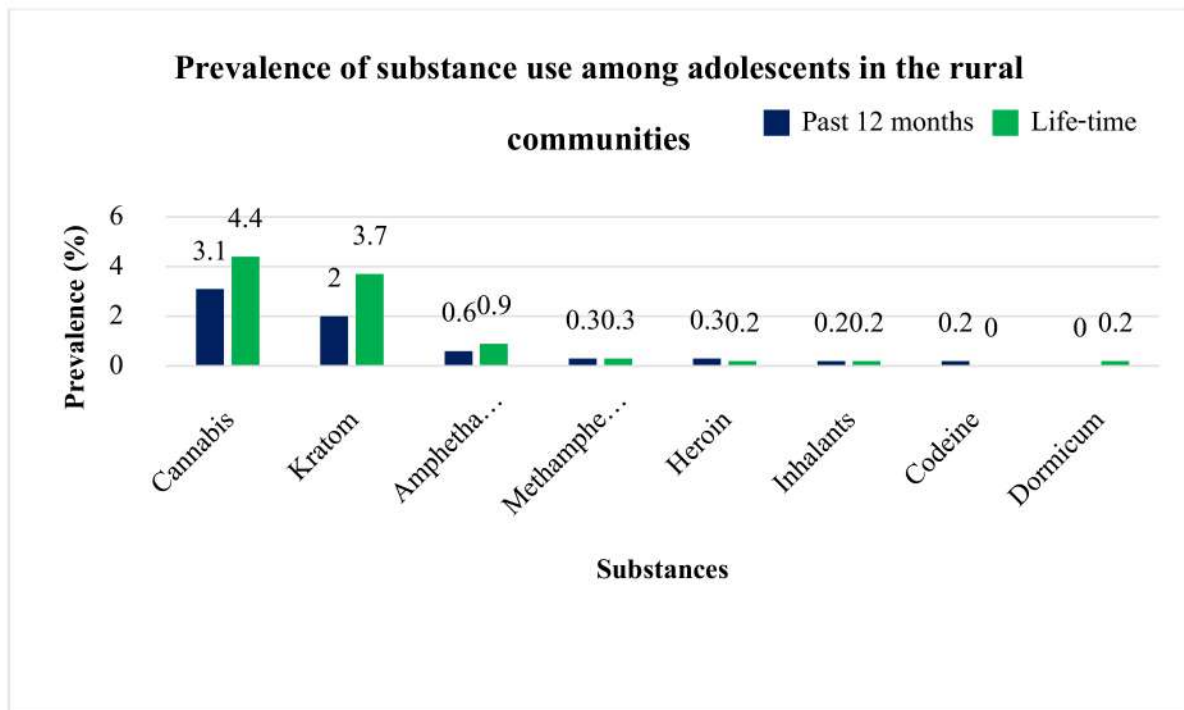
Table 2. Univariate analysis for factors associated with one year substance used

| Factors | Substance used | | Crude ORs | 95% CI | *p*-value |
| | No | Yes | | | |
	n (%)	n (%)			
Sex					
Female	334 (88.4)	44 (11.6)	1		
Male	205 (75.9)	65 (24.1)	2.41	(1.58-3.66)	<0.001
Age (year)					
mean ± S.D.	14.8±1.7	15.1±1.6	1.11	(0.98-1.25)	0.096
School					
School 2	175 (87.1)	26 (12.9)	1		
School 1	368 (81.6)	83 (18.4)	1.52	(0.94-2.44)	0.086
Grade					
$7^{th} - 9^{th}$	326 (83.8)	63 (16.2)	1		
$10^{th} - 12^{th}$	217 (82.5)	46 (17.5)	1.09	(0.72-1.67)	0.664
GPAX					
≥3.00	268 (85.1)	47 (14.9)	1		
<3.00	157 (83.5)	31 (16.5)	1.13	(0.69-1.85)	0.638
History of school suspension					
No	523 (84.4)	97 (15.6)	1		
Yes	13 (65.0)	7 (35.0)	2.9	(1.13-7.46)	0.027
History of parents being called by teacher					
No	517 (85.0)	91 (15.0)	1		
Yes	17 (56.7)	13 (43.3)	4.35	(2.04-9.25)	<0.001
Parents' marital status					
Married	336 (83.4)	67 (16.6)	1		
Widow	16 (72.7)	6 (27.3)	1.88	(0.71-4.98)	0.204
Divorced/Separated	189 (84.0)	36 (16.0)	0.96	(0.61-1.49)	0.839
Main guardian					
Father/Mother	367 (82.3)	79 (17.7)	1		
Ohers	176 (85.4)	30 (14.6)	0.79	(0.50-1.25)	0.317
Siblings					
One or more sibling	409 (83.1)	83 (16.9)	1		
No sibling	134 (83.8)	26 (16.3)	0.96	(0.59-1.55)	0.855
Residency					
Home	523 (83.4)	104 (16.6)	1		
Others	18 (78.3)	5 (21.7)	1.39	(0.51-3.85)	0.518
Family income per year (baht)					
<50000	69 (86.3)	11 (13.8)	1		

Table 2. Univariate analysis for factors associated with one year substance used

Factors	Substance used		Crude ORs	95% CI	*p*-value
	No	Yes			
	n (%)	n (%)			
≥50000	61 (79.2)	16 (20.8)	1.65	(0.71-3.82)	0.246
Social media use					
No	285 (83.6)	56 (16.4)	1		
Yes	258 (83.0)	53 (17.0)	1.05	(0.69-1.58)	0.832
Having boyfriend/girlfriend					
No	401 (85.1)	70 (14.9)	1		
Yes	142 (78.5)	39 (21.5)	1.57	(1.02-2.43)	0.042
Regular exercise					
No	283 (84.5)	52 (15.5)	1		
Yes	254 (82.2)	55 (17.8)	1.18	(0.78-1.79)	0.438
Having love problems					
No	350 (85.6)	59 (14.4)	1		
Yes	189 (79.1)	50 (20.9)	1.569	(1.035-2.38)	0.034
Having academic problems					
No	354 (86.8)	54 (13.2)	1		
Yes	189 (77.5)	55 (22.5)	1.91	(1.26-2.89)	0.002
Having financial problems					
No	268 (85.4)	46 (14.6)	1		
Yes	275 (81.4)	63 (18.6)	1.34	(0.88-2.02)	0.173
Having family problems					
No	379 (87.1)	56 (12.9)	1		
Yes	164 (75.6)	53 (24.4)	2.19	(1.44-3.32)	<0.001
Friend inducement of substance abuse					
No	467 (88.4)	61 (11.6)	1		
Yes	50 (59.5)	34 (40.5)	5.21	(3.12-8.68)	<0.001
Family member involves in addictive substance					
No	450 (85.1)	79 (14.9)	1		
Yes	63 (74.1)	22 (25.9)	1.99	(1.15-3.42)	0.013
Smoking					
No	499 (89.1)	61 (10.9)	1		
Yes	44 (47.8)	48 (52.2)	8.92	(5.48-14.54)	<0.001
Alcohol drinking					
No	375 (91.0)	37 (9.0)	1		
Yes	168 (70.0)	72 (30.0)	4.34	(2.81-6.72)	<0.001

Table 3. Multivariate analysis for factors associated with one year substance used

Factors	Substance used		Adjusted ORs	95% CI	*p*-value
	No n (%)	Yes n (%)			
Sex					
Female	334 (88.4)	44 (11.6)	1		
Male	205 (75.9)	65 (24.1)	2.19	1.16-4.16	0.016
Friend inducement of substance abuse					
No	467 (88.4)	61 (11.6)	1		
Yes	50 (59.5)	34 (40.5)	3.28	1.64-6.55	0.001
Smoking					
No	499 (89.1)	61 (10.9)	1		
Yes	44 (47.8)	48 (52.2)	3.22	1.50-6.90	0.003
Alcohol drinking					
No	375 (91.0)	37 (9.0)	1		
Yes	168 (70.0)	72 (30.0)	4.46	2.43-8.16	<0.001

Multivariate analysis (Backward Wald): adjusted for gender, friend inducement of substance use, smoking and alcohol drinking

The phenomenon may be explained by geographic area. The present study was conducted in remote rural communities where healthcare provider characteristics and health literacy differ from those of urban communities especially in remote rural areas.[8] Local people including adolescents and young adults may lack health literacy regarding the burden of illicit drugs as well as their complications. [12, 13]

Most studies found that substance abuse was more common among male adolescents.[7, 10, 14] In the present study, the prevalence of substance use among male adolescents was significantly higher as well. In the study, cannabis was the most commonly used substance with overall rate of one year abuse accounting for 3.1%. A similar result was found in one report from Thailand in 2001.[10] Cannabis is easy to access and cheaper than other illicit substances. Furthermore, cannabis is easy to cultivate in Southeast Asia and carries lower penalties compared with other illicit substances such as amphetamines. Similarly, kratom, *Mitragyna speciosa*, which has been traditionally used for both their stimulant properties as well as an opium substitute,[15] was the second most commonly used substance among adolescents accounting for 2%. One related study in Thailand illustrated that both cannabis and kratom were the most common one year use

substances among adolescents.[7] Adolescents may perceive that they take less risk in trying kratom than other substances; moreover, kratom is an addictive plant commonly found in Thailand and traditionally used by villagers especially in rural areas. Some villagers believed that kratom may enhance work performance by increasing endurance and tolerance and that it can be used to attenuate fatigue and treat some illnesses.[16]

Factors related to substance abuse included being male, friends persuaded to try the substance, smoking and alcohol consumption in the past 12 months. Among male adolescents, the prevalence of drug use was 2.19 times greater than that among female adolescents due to the nature of life style among friends and interests that differed from females.[17] Persuasion to use drugs in a group of friends increases the risk of substance abuse up to 3.28 times because Thai teenagers often join together as a group of friends and are at the age of wanting to be accepted by friends. Thus, adolescents are often persuaded in their group of friends to do something, to make themselves accepted by their group members.[18] Alcohol consumption in the past 12 months has been found to be related to substance use 4.46 times higher than nonalcohol consumption. Because alcohol is often consumed in a

group setting it can lead to loss of self-esteem, wherein they tend to be easily persuaded to use illicit drugs.[19] Smoking was found to be another factor related to substance abuse. Nicotine, the main addictive chemical in tobacco smoke, can induce dopamine release in the brain in a reward circuit creating a desire for other substances. Additionally, related studies have reported that adolescent nicotine exposure influences long term biochemical and functional changes in the brain that encourages subsequent drug use.[20, 21]

The limitations of this study were that only students from two schools were included in this study so it could not represent the whole population in rural communities. The study employed a cross-sectional design, making it difficult to establish a cause-and-effect relationship between associated factors and substance abuse.

In conclusion, the study showed a high prevalence of substance use among adolescents and associated factors included being male, friend inducement, smoking and alcohol consumption. The adolescents were in the age group that receives various social influences. Therefore, we should focus on this problem. Public health interventions aimed to prevent and reduce substance abuse should be designed so that these adolescents can grow into quality adults in the future.

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PREVALENCE OF SEXUAL DYSFUNCTION AND SEXUAL ATTITUDES AMONG POSTMENOPAUSAL FEMALE PATIENTS IN PHRAMONGKUTKLAO HOSPITAL

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Abstract

Background: Sexual function and attitudes towards sexuality among postmenopausal women have been investigated in many ethnicities. Nonetheless, a limited number of studies have been conducted among Thai postmenopausal women.

Objective: The study aimed to determine the prevalence of sexual dysfunction and sexual attitudes among Thai postmenopausal women.

Methods: A descriptive cross-sectional study was conducted from January 1st, 2018 to July 31st, 2018 at the Gynecologic Outpatient Department, Phramongkutklao Hospital. In all, 293 postmenopausal women, aged 45 years or over were recruited in the study. The Thai version Female Sexual Function Index (Thai-FSFI) questionnaire was used to evaluate the sexual function for which scores less than 26.5 constituted sexual dysfunction. To assess attitudes, validated questionnaires were used to evaluate using scores 0-8, 9-16 and 17-24 as negative, neutral and positive, respectively.

Results: The participants' mean age was 55.53 ± 5.07 years. The prevalence of sexual dysfunction was 96.59% (282/293), which was significantly higher compared with those with normal sexual function. Postmenopausal women with sexual dysfunction were significantly older ($p<0.001$), had a longer menopause period ($p=0.001$), had spouses at old age ($p<0.001$) and had underlying diseases ($p=0.034$) significantly more than those with normal sexual function. Regarding sexual attitudes, 52.56% had positive attitudes while 4.44% had negative attitudes.

Conclusion: Sexual dysfunction is a common problem among Thai postmenopausal women. However, most had positive sexual attitudes.

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Introduction

Sexuality is defined as feelings, attraction and behaviors between two people. Both mental and physical health are factors which impact positive sexual attitudes. Preparing before having sex includes coaxing and proper timing to make it more enjoyable. Regarding the Masters and Johnson model,[2] the sexual response cycle consists of four phases, i.e., the first stage, excitement or arousal phase, of which the sexual response involves increasing blood flow and nerve stimulation in the pelvic area. Among women, production of vaginal lubrication and sexual tension can occur. The second stage or plateau phase occurs after stimulation in phase 1 has been intensified so that the vagina and clitoris become highly sensitive. The third stage or orgasmic phase is the climax of the sexual response during which the heart rate and blood pressure are at their highest. The fourth stage or resolution phase occurs when the body returns to its normal level of functioning. After this phase, women do not need the refractory period; however, men do.

Based on Kaplan's theory about sexual needs, a woman's sexual response is divided in three parts consisting of desire, arousal and orgasm.[3] Sexual activity can occur at any age but mostly occurs during reproductive age. Having a longer life leads not only to a rise in number of aging population but also increased sexual problems.

Sexual problems among the elderly result from many factors. Among females, the major factor is physiological change due to menopause. Due to decreasing sex hormones, menopausal women suffer from vaginal dryness, vasomotor symptoms, mood changes and increase of underlying diseases such as heart disease, hypertension and osteoporosis. In addition, some cultures believe that the elderly shouldn't be interested in sexual activity. For these reasons, in some countries, most elderly have little interest in sex or wouldn't want to have sex.

Related studies showed that 84.1% of Paraguayan middle age females were sexually active while 25.6% experienced sexual dysfunction.[4] On the other hand, other studies have reported 81.5% of elderly women experienced sexual dysfunction and 62.1% had negative sexual attitudes.[5] Studies have confirmed that sexual desire decreased among postmenopausal women;[6, 8] however, sexual dysfunction has been increasing especially among women having underlying diseases.[7] Sexual dysfunction is a common problem among postmenopausal women decreasing the quality of life.[9] However, the prevalence of sexual dysfunction differs among different countries and study areas.

Due to limitations of data among Thai postmenopausal women, the main purpose of this study was to evaluate the prevalence of sexual dysfunction and attitudes among postmenopausal women attending the Gynecologic Outpatient Department at Phramongkutklao Hospital.

Methods

This cross-sectional study was approved by the Institutional Review Board, Royal Thai Army Medical Department. Postmenopausal women attending the Outpatient Department of Gynecology, Phramongkutklao Hospital from April 1st, 2018 to July 31st, 2018 were recruited in the study. Inclusion criteria comprised Thai women with naturally occurring menopause and those with surgical menopause who were at least 45 year old and had sexual activity more than once monthly. Exclusion criteria included those unable to read and write Thai, presenting physically defect or having psychological problems.

A total of 293 participants were recruited in the study. After the complete informed consent was processed, the participants were requested to complete two parts of self-questionnaires of the Thai version Female Sexual Function Index (Thai-FSFI). The first part covered female sexual function index (FSFI) using a validated questionnaire originally created by Rosen et al.[10] This questionnaire was translated to the Thai version or Thai-FSFI.[11] The Thai-FSFI was divided in six sections consisting of desire, arousal, lubrication, orgasm, sexual satisfaction and pain.[12] Of 19 questions, scores totaled 36. The minimal score is 1.2 and the maximum score is 6 in each section. Scores less than 26.5 constitute sexual dysfunction. The second part comprised the sexual attitude questionnaire consisting of 12 questions; each question is scored 0 to 2. Thus, the minimum score is 0 and the maximum score is 24. Scores of 0 to 8 are considered negative attitudes, scores 9 to 16 are neutral and scores over 16 constitute positive attitudes.

All data were analyzed using SPSS, Version 17.0.

Descriptive statistics were used to analyze participant's characteristics and attitudes. The Chi-square test and Fisher's exact test were used to compare frequency distribution of categorical variables. All tests found significance at $p < 0.05$.

Results

The prevalence of sexual dysfunction among post-menopausal female patients was 96.5%. The demographic and baseline disease characteristics of the postmenopausal female patients are shown in **Table 1.** The mean participants' age was 55.32±5.13 years and the mean time of menopausal period was 5.49±3.8 years. According to the results, approximately one third of participants had underlying diseases (32.76%), experienced sexual abuse (1.37%) and received hormonal therapy (23.89%). The participants' spouse mean age was 56.85±5.98 years.

As shown in **Table 2**, 89.42% had no underlying diseases, 16.04% consumed alcohol and 7.17% smoked. As shown in **Tables 3 and 4**, age of postmenopausal women and their spouse in the sexual dysfunction group was significantly higher than those of the normal sexual function group ($p < 0.001$). A significant difference of mean menopausal period was found between the normal sexual function group (2.1±1.66 years) and the sexual dysfunction group (5.61± 3.80 years) ($p = 0.001$). In addition, subjects with sexual dysfunction presenting underlying diseases significantly differed compared with the normal sexual function group ($p = 0.034$).

Regarding sexual attitudes, approximately one half of the participants (52.56%) had positive attitudes, 43% had neutral attitudes, but only 4.44% had negative attitudes (data not shown).

Table 1. Characteristics of the enrolled participants (N= 293)

Characteristics	Number	%
Age (years)		
mean ± SD		55.53±5.07
Menopausal period (years)		
mean ± SD		5.49±3.80
Education	148	50.51
Working	163	55.63
Underlying diseases	197	67.24
Alcohol drinking	3	1.02
Smoking	3	1.02
Sexual abuse	4	1.37
Hormonal used	70	23.89

Table 2. Characteristics of spouses (N=293)

Characteristics	Number	%
Age (years) mean ± SD		56.86 ± 5.98
Underlying diseases	31	10.58
Alcohol drinking	47	16.04
Smoking	21	7.17

Table 3. Characteristics of postmenstrual women associated with sexual dysfunction

Characteristics	Normal 11 (%)	Sexual Dysfunction 282 (%)	p-value
Age (years) mean±SD	49.30±2.67	55.53±5.07	<0.001
Menopausal period, years mean ± SD	2.10±1.66	5.61±3.80	0.001
Education			
Yes	6(4.05)	142(95.95)	0.750
No	5 (3.45)	140 (96.55)	
Working			
Yes	8(4.91)	155(95.09)	0.194
No	3 (2.31)	127(97.69)	
Underlying diseases			
Yes	10(5.08)	187(94.92)	0.034
No	1(0.04)	95(99.06)	
Drinking alcohol			
Yes	0 (0)	3(100)	1.000
No	11(1.02)	279(98.98)	
Smoking			
Yes	0 (0)	3(100)	1.000
No	11(1.02)	279(98.98)	
Sexual abuse			
Yes	-	4(100)	1.000
No	11(3.81)	278(96.19)	
Hormonal used			
Yes	3(4.29)	67(95.71)	0.707
No	8 (3.59)	215 (96.41)	

Table 4. Characteristics of participant' spouse associated with sexual dysfunction (N=293)

Characteristics	Normal N=11(%)	Sexual Dysfunction N=282 (%)	p-value
Age years (mean±SD)	49.70±3.86	57.11±5.98	<0.001
Underlying diseases	0(0)	31(10.99)	1.000
Alcohol drinking	0 (0)	47(16.67)	1.000
Smoking	0 (0)	21(7.45)	1.000

Discussion

When compared with related studies, [4] similar results were observed for which sexual dysfunction was a common problem among postmenopausal women. In this study, the prevalence of sexual dysfunction among postmenopausal women attending the Outpatient Department of Gynecology, Phramongkutklao Hospital was rather high (96.59%). The prevalence was much higher when compared with studies in other countries; however, approximately one half still had positive sexual attitudes. This could have resulted from ethnicity, population characteristics, religion, cultural differences, social problem and using different questionnaires to evaluate sexual dysfunction. Those reporting positive attitudes could have recognized sexuality as a natural part of life.

Participant's and spouse's age were important factors concerning sexual dysfunction. Among postmenstrual women, decreasing estrogen levels could have affected sexual function. Experiencing vasomotor symptoms and vaginal dryness would lead to decreased sex drive or having unpleasurable sex due to dyspareunia. The longer the postmenopausal period they had, the higher the prevalence of sexual dysfunction was found. Moreover, not only decreased hormones and sexual emotion, but also culture may affect sexual activity and function especially among Thai postmenopausal women. Another important factor affecting sexual function was underlying diseases for which a higher prevalence of sexual function was observed among postmenopausal women. Some diseases could have made them too tired or stressed including certain prescription drugs which would have decreased the sex drive and could interfere with sexual activity. To handle the problem, providing sexual knowledge could decrease sexual dysfunction among females and their spouses.

The strength of this study was the use of a validated standard questionnaire, used worldwide to evaluate sexual function. Because data of the prevalence of sexual dysfunction among Thai postmenopausal women are limited, the preliminary data in this study provided greater understanding of importance issues concerning mental and physical health status of Thai postmenopausal women aged 45 years or over. Nevertheless, some limitations were observed. The results from this study could only represent one hospital-based population. A high prevalence of sexual dysfunction could have resulted from the selection of participants. This study evaluated menopausal status among both natural and surgical postmenopausal Thai women at the Gynecologic Outpatient Department sharing common health problems. Other information of spouses' health status could not be obtained because questionnaires were not assessed by the spouses themselves. Moreover, precise details about sexual attitudes were not assessed; thus, reasons for having positive, neutral or negative sexual attitudes in the study group remained unclarified. Further information from a qualitative study of their attitudes, sexual knowledge and behaviors would be useful to reduce or prevent sexual dysfunction.

In conclusion, sexual dysfunction was observed to be a common problem with high prevalence among post-menopausal female patients in Phramongkutklao Hospital. Postmenopausal women with sexual dysfunction were significantly older, had a longer menopause period, had elderly spouses and had more underlying diseases than those who experienced normal sexual function. However, about one half had positive sexual attitudes.

Acknowledgement

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