ORIGINAL ARTICLE

Low Back Pain Prevalence: A Survey Analysis of Postgraduate Trainees in Operating Room vs. Non-operating Room Settings

Jidapa Sae-lim, MD[1], Kritsana Kientchockwiwat, MD[2], Sirikarn Tangcheewinsirikul, MD[1]

[1] Department of Pediatrics, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand

[2] Department of Rehabilitation, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, Bangkok, Thailand

Background: Low back pain (LBP) is a considerable health issue affecting the quality of life and commonly observed among medical professionals.

Objective: Investigate LBP prevalence and its related disabilities and identify factors correlated with the occurrence of LBP in postgraduate trainees.

Materials and Methods: This cross-sectional study investigated 133 postgraduate trainees at the Faculty of Medicine Vajira Hospital, Bangkok, Thailand including 10 departments. The participants were classified into two groups: working in the operating room (OpR) and not working in the operating room (non-OpR). Data were collected through a validated self-administered questionnaire from January– December 2023. Disability was then assessed using the Thai Modified Oswestry LBP Disability (MOD) questionnaire.

Results: Among the 133 participants enrolled in the present study, 115 were included in the final assessment. Females accounted for 52.2% (60) of the participants and were predominant in the non-OpR (36 out of 66, 54.6%). The mean age was 29.2±6.9 years. The 12-month prevalence of LBP was 35.7%, with no difference was observed between the OpR and the non-OpR group (p=0.563). Approximately two thirds (65.2%) reported exercising for a median duration of 1.0 (IQR 0,3) hours/day. Long screen time using phone/computer [odds ratio (OR) 4.7, 95% confidence interval (CI) 1.9 to 11.5, p<0.001] and family history of LBP (OR 3.1, 95% CI 1.2 to 7.9, p=0.019) were the two independent factors correlated with LBP. Multivariable logistic regression analysis revealed that family history of LBP was the only factor significantly correlated with LBP. Mild disability assessed by MOD was the most prevalent category 35 (85.4%).

Conclusion: While the prevalence of LBP among postgraduate trainees in Thailand was comparable with that in other studies, there was no LBP difference among the OpR and non-OpR group. Family history of LBP was only a dependent factor for this condition.

Keywords: Low back pain; Back pain; Postgraduate trainees; Disability

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Low back pain (LBP) is a common type of musculoskeletal pain that significantly affect the quality of life and functionality of individuals across various age groups[1,2]. According to the Global Burden of Disease 2010 and a recent meta-analysis, LBP remains a leading causes of disability-adjusted life years and affects the number of emergency department visits leading to hospital admissions, indicating its impact on personal health and economics[2,3]. Various risk factors, including abnormal posture, monotonous work, lack of exercise, stress, sedentary behavior, and obesity, are associated with LBP development[4-10]. Health science students including medical students are exposed to such factors, predisposing them to LBP.

The broad prevalence of LBP among medical students ranges from 20.8% to 81.7%[11,12]. In addition to personal and ergonomic factors, work-related risk factors, such as monotonous work, prolonged sitting, prolonged standing, and excessive screen time on computers or tablets, pose a significant impact on LBP[10,11,13]. Despite the well-documented prevalence of LBP, research focusing on the prevalence and associated factors of LBP among postgraduate trainees, including residents and fellows, is limited.

The current study aimed to investigate the prevalence of LBP and its correlated factors. As well as explore

Correspondence to:

Tangcheewinsirikul S.

Department of Pediatrics, Faculty of Medicine Vajira Hospital, Navamindradhiraj University, 681 Samsen Road, Dusit, Bangkok 10300, Thailand.

Phone: +66-2-2443156

Email: sirikarn.t@nmu.ac.th

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LBP correlated disabilities through a self-administered questionnaire. Additionally, we sought to compare the difference of factors between postgraduate trainees working in the operating room (OpR) and those who do not (non-OpR). Given the variation in work practices across different departments, the factors contributing to LBP may provide additional evidence. This variation is particularly pertinent for postgraduate trainees who work in the OpR and adopt inappropriate or prolonged work postures, which are potential factors contributing to the onset of LBP. Therefore, this research categorized postgraduate trainees based on their work setting to provide insights into LBP factors.

Materials and Methods

This cross-sectional study was conducted among postgraduate trainees at the Faculty of Medicine Vajira Hospital from January to December 2023. Participants with underlying spinal diseases, history of back injury, morning stiffness, and red-flag signs such as night pain or refer pain were excluded. The remaining participants were categorized into two groups: those practicing in the OpR, including orthopedic surgeons, otolaryngologists, obstetricians and gynecologists, surgeons, anesthesiologist, and ophthalmologists; and the non-OpR group, including pediatricians, internists, emergency medicine physicians, and family medicine physicians. Ethical approval was obtained from the Research Ethics Committee, Faculty of Medicine Vajira Hospital (COA 059/65E). Written inform consent was obtained from all the participants.

The sample size was determined in consultation with biostatistics team, using a finite population proportion approach. Based on a population of 279 postgraduate trainees and a proportion of 0.2[12], with a margin of error (d) of 0.05, the required sample size was calculated to be 131. To accommodate a 20% dropout rate, the final sample size was adjusted to approximately 157. The initial version of self-administered questionnaire in Thai language consisted of 22 questions aimed at assessing LBP and exploring correlated factors. LBP in our study was defined as non-specific pain or discomfort experienced between the lower edge of the ribs and the buttock[14]. These questions were developed based on a literature review and a focus group. The questionnaires were then distributed to three healthcare experts in musculoskeletal field for validity assessment using the item-content validity index (i-CVI). Two question was removed due to an i-CVI of 0.3, indicating inadequate validity, while the remaining 20 questions underwent minor revision to enhance precision. The revised version was subsequently evaluated by the same experts, revealing i-CVI scores ranging from 0.7 to 1.0, with an overall content validity for the scale of 0.88. The revised version was later distributed to a separate group of 50 postgraduate trainees to assess reliability, demonstrating a Cronbach's Alpha coefficient of 0.9. The validated questionnaire covered participant demographics, activities related to LBP (exercise, alcohol, caffeine, smoking, shoe type, and duration of sitting/sleeping/screen use), LBP symptoms and severity, and disability assessed by the Modified Oswestry LBP Disability (MOD) questionnaire. The MOD translated into Thai language and validated by experts was employed for evaluating the severity of disability to minimize information bias. The MOD comprises 10 questions evaluating pain severity, self-care (bathing and dressing), lifting, walking, sitting, standing, sleeping, social interaction, travel, and household chores. Scores were labeled as mild disability (0 to 20), moderate disability (21 to 40), severe disability (41 to 60), cripple (61 to 80), and bedbound or symptom magnifier (81 to 100)[15].

Data were analyzed using IBM SPSS Statistics for Windows, Version 28.0 (IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY, USA: IBM Corp). Descriptive statistics were used to describe participant characteristics, including categorical data such as gender, year of training, smoking, alcohol, caffeine, exercise habits, family history of LBP, and footwear characteristics reported as frequencies and percentages. Continuous data including age, weight, height, body mass index, duration of sitting, duration of sleeping, and duration of screen time using mobile phone or computer (hours per day) were reported as mean±standard deviation or median and interquartile range (IQR) according to the appropriateness of the data. Student's test and one-way ANOVA were utilized to compare parametric data, and Mann–Whitney test and Kruskal–Wallis test were employed to compare nonparametric continuous data. For categorical data, Chi-square test or Fisher's exact test were applied whenever applicable. Logistic regression analysis was used to assess LBP-related factors, reported as odds ratio (OR) and a 95% confidence interval (CI). Significant variables from this analysis were further examined using a forward stepwise linear regression model to identify independent LBP-related factors, with outcomes reported as adjusted odds ratio (aOR). For all analyses, a p-value <0.05 was considered as statistically significant. The study adhered to the reporting guideline established by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[16].

Results

Among the 279 postgraduate trainees, 133 (response rate was 47.7%) consented to participate in the study. Eighteen participants were excluded due to specific health conditions (6 reported morning stiffness, 5 with referred pain, 2 with night pain, 4 with a history of accidents involving the spine, and 1 with c-spondylosis). Those excluded participants were scheduled to visit a specialty clinic upon first recognition of symptoms for further evaluation of red flag signs, while those with known underlying condition already had appointment in place. Females accounted for 52.2% (60) of the participants and were predominant in the non-OpR group (36 out of 66, 54.6%). The distribution of LBP in each department is described in Figure 1. The mean age was 29.2±6.9 years, the average weight was 64.3±15.2 kg, and the BMI was 23.4±8.2 kg/m^2. Approximately one third of the participants reported alcohol consumption (32, 27.8%), the majority reported caffeine intake (86, 74.8%), and only one (0.9%) reported smoking. No significant differences in alcohol consumption, caffeine intake, or smoking were found between the OpR and non-OpR groups.

Moreover, 75 participants (65.2%) engaged in physical exercise for an average duration of one hour per day (IQR 0,3). The average daily duration of activities was as follows: sitting, 6 hours (IQR 4,8); sleeping, 6 hours (IQR 6,7); and screen time using phone or computer, 5 hours (IQR 3,8). Regarding footwear, 75 participants (65.2%) wore ballerina flats or leather shoes, 41 (35.7%) wore sneakers, and 3 (2.6%) wore high heels. In addition, 20% reported a family history of LBP, with a higher incidence observed in the OpR group compared with that in the non-OpR group. The demographic data and clinical characteristics are presented in Table 1.

Our study revealed a 12-month prevalence of LBP at 41 (35.7%), with the majority experiencing mild disability (35 cases, 85.4%). Interestingly, no difference in LBP prevalence was observed between the OpR (16, 39%) and the non-OpR group (25, 61%). Univariable logistic regression analysis revealed the following factors that statistically significantly influenced LBP: more than 6 hours/day of phone or computer use (OR 4.7, 95% CI 1.9 to 11.5, p<0.001) and family history of LBP (OR 3.0, 95% CI 1.1 to 8.5, p=0.019). Practicing in OpR, gender, obesity, sitting or sleeping patterns, and type of exercise were not demonstrated as a correlated factor as shown in Table 2.

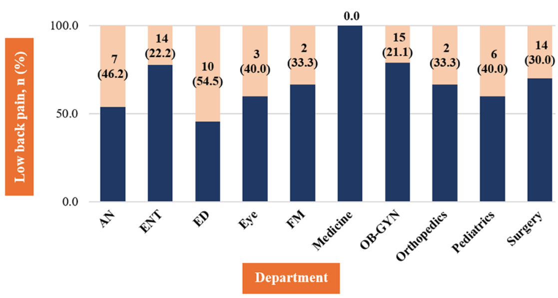

Figure 1. Distribution of low back pain in each department.

AN=Anesthesiology; ENT=Otolaryngology; ED=Emergency Department; FM=Family Medicine; OB-GYN=Obstetrics and Gynecology

Family history of LBP showed a statistically significant association with LBP [adjusted OR (aOR) 3.3, 95% CI 1.2 to 9.2, p=0.019], indicating that it is an independent factor related to LBP development among the participants.

Discussion

LBP remains a significant health concern affecting individuals of all ages[17]. Its risk factors include stress, sedentary behavior, inappropriate posture, and insufficient rest time[5,6,9,11,18,19]. Health science students, including medical students, are exposed to such factors and thus are considered predisposed to LBP. The broad prevalence of LBP in medical students ranges from 20.8 to 81.7% as reviewed in Table 3.

Our study revealed a 12-month prevalence of LBP among postgraduate trainees to be 35.7%, which is lower than the 56.8% reported in a study on postgraduate trainees at Tabriz University[10]. Another investigation involving postgraduate trainees in China after standardized training reported a prevalence of 75.9%[20]. These variations could be attributed to the differences in activity factors and variations among different population groups.

Physical exercises, including stretching and strengthening, reduce the subsequent occurrence of LBP by approximately 30%, along with pain severity and disability[4]. Exercise concomitant with education has also demonstrated a significant reduction in LBP as indicated by a large meta-analysis[33]. Therefore, the high proportion of participants engaged in physical exercise (65.2%) in our study could be considered a protective factor that contributes to the lower prevalence of LBP compared with that in a Chinese study, where only 21.2% of the participants engaged in physical exercise[20]. In comparison to postgraduate trainees, the prevalence of LBP among undergraduate medical students at our center was higher, at 55.5% versus 35.7%. Additionally, nearly half (48.6%) of undergraduate medical students reported not engaging in any exercise, which may be a contributing factor to the difference observed between the two groups[26].

Several studies have consistently identified family history of LBP as a significant risk factor[8,12,21,26], corroborating our findings. Our study also found a significant correlation between family history of LBP and an increased risk of developing LBP. This result aligned with the research conducted at a medical college in Delhi[8] and a study involving medical students in Serbia[12], both of which found that individuals with a family history are at a higher risk of experiencing LBP compared with those without. Similarly, a study on musculoskeletal pain in Malaysia revealed that family history was associated with pain in the neck, shoulder, and low back area[29]. While several potential mechanisms have been suggested for the

Table 1. Demographic and clinical characteristics of participants (n=115)

Variables	OpR	Non-OpR	p-value
Number, n (%)	49 (43)	66 (57)	
Female	24 (49.0)	36 (54.6)	0.555
Age (year), mean±SD	28.7±2.0	29.5±9.0	0.501
Body weight (kg), mean±SD	64.6±12.7	64.0±17.0	0.836
Height (cm), mean±SD	167.5±8.7	165.6±11.9	0.331
BMI (kg/m^2), mean±SD	22.9±3.5	23.7±10.4	0.569
Year of resident			0.141
Year 1	34 (69.4)	43 (65.2)	
Year 2	6 (12.2)	9 (13.6)	
Year 3	6 (12.2)	14 (21.2)	
Year 4	3 (6.1)	-	
Smoking	1 (2.0)	0 (0)	0.244
Alcohol drinking	14 (28.6)	18 (27.3)	0.878
Caffeine drinking	38 (77.6)	48 (72.2)	0.789
Exercise	32 (65.3)	43 (65.2)	0.500
Duration of exercise (hours/day), median (IQR)	1 (0,3)	1 (0,2)	0.535
Duration of activity (hours/day), median (IQR)			
Sit	8 (5,10)	6 (4,8)	0.052
Sleep	6 (6,7)	6 (6,7)	0.301
Phone/computer	4 (3,8)	5 (4,7)	0.700
Shoe type			
Ballerina flat/leather shoes	32 (65.3)	43 (65)	0.986
High heel	2 (4.1)	1 (2)	0.393
Sneaker	17 (34.7)	24 (36)	0.853
Low back pain in family	12 (24.5)	11 (17)	0.319
Frequency of pain (days/week), median (IQR)	0 (0, 2)	0 (0, 2)	0.594
Disability by MOD, n=41			0.637
No disability	2 (12.5)	4 (16.0)	
Mild disability	14 (87.5)	21 (84.0)	

IQR=Interquartile range; MOD=Modified Oswestry Disability questionnaire; Non-OpR=non-operating room involvement; OpR=Operating room involvement

relationship between family history and LBP, no definitive explanation has been established. The biopsychosocial model[34] suggested that LBP could be influenced by health-related behaviors shared among family members or socioeconomic factors common within families[35,36]. Future research is needed to further explore the link between family history and LBP.

Sedentary behaviors have been recognized as a risk factor for LBP[5,6]. In China, postgraduate trainees who reported prolonged sitting (aOR 13.1, 95% CI 2.4 to 71.3, p=0.003) were identified as at risk for LBP[20]. Health science students spending more than 6 to 10 hours/day on a computer or tablet were also at risk for LBP[21,24,28]. Our study explored the correlation between the duration of activities such as sitting, sleeping, and using electronic devices such as phones or computers and the occurrence of LBP. Our result found that sitting more than 6 hours/day was an independent risk factor for LBP. However, this factor did not reach statistical significance in the multivariable logistic regression analysis possibly due to the limited number of participants. As a consequence, the power of differentiation for this factor may have been inadequately demonstrated. Similarly, the type of exercise was not correlated with LBP. The majority of our participants engaged in endurance exercises (51.2%); the population engaging in strength and stretching exercises was not substantial enough to demonstrate statistically significant differences.

Various studies investigated the role of gender and correlated factors in LBP development, with some indicating these two as potential risk factors; however, this is not always the case. Studies conducted among Brazilian, Bangladeshi, and Chinese medical students demonstrated that females are likely to experience LBP[11,13,20,25]. Conversely, Al Shayhan et al.[28] reported that males have a high likelihood of experiencing LBP due to their age. In our study, we did not observe any significant difference in the occurrence of LBP between the two genders, aligning with previous findings[8,12,18,29].

Table 2. LBP and correlated factors among participants

Factors	univariate				multivariate	
	Outcome, n (%)		OR (95% CI)	p-value	aOR (95% CI)	p-value
	LBP (n=41)	No LBP (n=74)				
Female	25 (61.0)	35 (47.3)	1.7 (0.8–3.8)	0.161		
Weight status						
Underweight	3 (7.3)	7 (9.5)	1			
Normal	27 (65.9)	53 (71.6)	1.2 (0.3–5.0)	0.813		
Overweight	8 (19.5)	9 (12.2)	2.1 (0.4–10.8)	0.387		
Obesity	3 (7.3)	4 (5.4)	1.4 (0.2–8.6)	0.587		
Specialty						
Non-OpR	25 (61.0)	41 (55.4)	1			
OpR	16 (39.0)	33 (44.6)	0.8 (0.4–1.7)	0.563		
Sitting duration						
≤6 hours/day	13 (31.7)	22 (29.7)	1			
>6 hours/day	28 (68.3)	52 (70.3)	0.9 (0.4–2.1)	0.825		
Sleeping duration						
≤6 hours/day	26 (63.4)	45 (60.8)	1			
>6 hours/day	15 (36.6)	29 (39.2)	0.9 (0.4–2.0)	0.783		
Phone/computer used						
≤6 hours/day	15 (36.6)	54 (66.2)	1			
>6 hours/day	26 (63.4)	20 (33.8)	4.7 (1.9–11.5)	<0.001*	0.9 (0.4-2.0)	0.779
Family history of LBP	13 (32.5)	10 (13.5)	3.1 (1.2–7.9)	0.019*	3.3 (1.3-8.5)	0.015*
Type of exercise						
Endurance	21 (51.2)	38 (51.4)	1.0 (0.5–2.1)	0.989		
Strength	3 (7.3)	10 (13.5)	0.5 (0.1–1.9)	0.322		
Stretching	1 (2.4)	4 (5.4)	0.4 (0.0–4.1)	0.467		

aOR=adjusted odds ratio; LBP=Low back pain; Non-OpR=non-operating room involvement; OpR=Operating room involvement; OR=Odds ratio

The prolonged use of electronic devices per day has been identified as a potential risk factor for the development of LBP[21,28,29]. A 2018 study from Saudi Arabia revealed that individuals spending more than 10 hours daily on tablets and computers exhibited an increased likelihood of experiencing LBP[28]. Similarly, investigations conducted within Jordanian populations indicated that those who used computers for over 6 hours per day were at a high risk for LBP[21]. Contrary to these finding, our study did not find a significant correlation between the duration of electronic device use and the occurrence of LBP. This discrepancy may be partially attributed to the relatively limited number of participants in our study, possibly constraining the statistical power to identify significant associations. Future studies might consider to separate the variables of electronic devices, such as mobile phones, tablets, and computers, from each other because the different usage patterns and postures associated with each device type may have varying influences on the prevalence of LBP.

Our study was constrained by a limited number of participants enrolled in a single-center study, which may affect the generalizability of our findings and the identification of factors correlated with LBP. Future research would benefit from prospective cohort, multicenter studies to improve the applicability of these results. Although our paper-based survey enabled in-person interviews and comprehensive data collection, providing valuable insights and justifying participation compensation, time constraints from postgraduate trainees limited our ability to address important factors such as psychological aspects, static work duration, operating room conditions, and prolonged inappropriate postures. We believe that integrating virtual interviews in future studies could offer more comprehensive insights into participant experiences and ensure the relevance of the collected data.

Conclusion

The prevalence of LBP poses a notable concern for disability among trainees. In our study, no significant difference was observed between the OpR and non-OpR groups. The substantial engagement in exercise activity among the participants may account for the relatively low prevalence of LBP, which is in line with the findings from comparable studies. Our research underscores the

Table 3. Summary of LBP prevalence and associated factors among undergraduate medical students and postgraduate trainees in various countries

Authors	Y	Country	n (% F)	12M-P (%)	Correlated factors	
Samarah[21]	2023	Jordan	593 (62.2)	63.1	- Computer using ≥6 hr/day	- Psychosomatic symptoms
					- Family history of LBP	
Zhang[20]	2023	China	345 (65.8)	75.9	- Prolonged sitting duration	- Low physical exercise
					- Working period >40 hr/week	
Thejaswi[22]	2023	India	199 (55)	86	NA	
Boussaid[23]	2023	Tunisia	148 (NA)	80.4	- Depression feeling	- Poor layout of the amphitheaters
					- Second cycle of medical students	
Salamah[24]	2022	Jordan	282 (61.7)	62.1	- Abnormal pusture	
Lin[25]	2022	China	772 (49.4)	28.1	- Famale	- PSS 10 score
					- Study year	- Stomatology students
Kientchockwiwat[26]	2022	Thailand	146 (62.3)	55.5	- Family history of LBP	- Underweight
Ilic[12]	2021	Serbia	499 (67.7)	20.8	- Smoking	- Incorrect sleeping posture
					- Stress during class	- Family history of LBP
Sany[13]	2021	Bangladesh	207 (55.6)	63.3	- Female	- Chair without back support
					- BMI >25 kg/m^2	- Chair with non-adjustable back support
					- Low and moderate frequency of physical activity	- Non-adjustable sitting surface
					- Sitting ≥6 hours/day	
					- Not enough rest time	
Tavares[11]	2019	Brazil	629 (72.8)	81.7	- Anxiety	- Physical dysfunction
					- Depression	
Amelot[11]	2019	France	1,243 (65.6)	72.1	- Walking ≥30 mins/day	- Weekly exercise
Dughriri[7]	2019	Saudi Arabia	440 (50)	61.4	* History of trauma	* History of psychosomatic symptom
					* History of depressive symptom	
Haroon[18]	2018	Rakistan	360 (71.7)	38.6	* Mental stress	
Vujcic[27]	2018	Serbia	459 (66)	59.5	NA	
Al Shayhan[28]	2018	Saudi Arabia	328/1,052 (70.9)	48.8	- Backpack	- Uncomfortable bed
					- Tablet or computer >10 hr/day	- Uncomfortable furniture
Shams Vahdati[10]	2014	Iran	125 (41.6)	56.8	- Exercise as protective factor	
Al Shagga[29]	2013	Malaysia	232 (62.9)	46.1	* Clinical year	*History of trauma
					* Computer used	
Aggawal[8]	2013	India	160 (46.2)	47.5	- Backpack	- Family history of LBP
					- Abnormal body posture	- Monotonous work
					- Abnormal study place (non-study table)	
Moroder[30]	2011	Austria	103 (52.4)	53.4	- not associated with sedentary lifestyle and sitting duration	
Falavigna[31]	2011	Brazil	207 (59.9)	59.9	NA	
Smith[32]	2005	China	207 (53.1)	40.1	- High mental stress	

12M-P=12 months prevalence; F=Female; LBP=Low back pain; M=month; NA=Not applicable; PSS=Perceived stress scale; Y=Year

* Factors associated with musculoskeletal (neck, shoulder, lower back) pain

significance of family history of LBP as a risk factor for LBP.

What is already known on this topic?

The prevalence of LBP in medical students have extensively studied, yielding varied results. These variations are often attributed to differences in physiological and psychological factors. Some studies suggest that intense academic pressures and prolonged period of monotonous work may contributed to increased LBP prevalence, but the specific factors and their influence remain a subject of ongoing research.

What this study adds?

Our study reveals a modest prevalence of LBP among postgraduate medical students, with no significant difference in LBP prevalence between the OpR and non-OpR groups. However, the study finds that a family history of LBP is a significant factor associated with LBP symptoms.

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of the Faculty of Medicine Vajira Hospital (COA 059/65E), and participants' written informed consent have been obtained.

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Conflicts of interest

The authors declare no conflict of interest.

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