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## Leg cramps, its associated factors and quality of life among pregnant mothers: A cross-sectional study in a Malaysian suburban health clinic.

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### ABSTRACT

Leg cramps (LCs) are common in pregnancy and may affect pregnant mothers' quality of life (QoL). However, studies to show this impact are still lacking. Thus, this study aimed to evaluate the association of LCs with QoL among pregnant mothers. The magnitude and characteristics of LCs were assessed too. A cross-sectional study was conducted at a government health clinic in Hulu Langat, Selangor involving 99 mothers in their second or third trimesters, recruited through convenience sampling between March and April 2018. This study used a developed bilingual (Bahasa Malaysia and English) self-administered questionnaire on leg cramps profile, as well as the bilingual self-administered SF-12v2, to assess their QoL. About 71.7% experienced LCs during this pregnancy. About half experienced LCs once to twice a week and 63.4% had moderately painful LCs. Only 26.7% had severely painful LCs and 12.7% had the next-day soreness in all or most of the time. Gestational age ( $P=0.001$ ) and booking Body Mass Index (BMI) ( $p=0.022$ ) were significantly associated with LCs, but not their QoL ( $p=0.712$  for PCS and  $p=0.118$  for MCS). Generally, LCs were common among these pregnant mothers. However, LCs appear to be brief, infrequent, and mild which did not significantly affect their QoL. Nevertheless, LCs should not be disregarded, as a subgroup of them experienced severe LCs with the next day soreness who may need further assessment and treatment.

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### INTRODUCTION

Leg cramps (LCS) is a common musculoskeletal condition that is characterised by involuntary painful

contractions of the leg muscles including the calf, hamstrings or foot muscles that occur suddenly at night and maybe episodic (Allen and Kirby, 2012). LCs are relieved by forceful stretching of the muscles affected, but the pain may linger on to the following day (Hensley, 2009). About 7 to 20% of LCs can happen during daytime only or either day or night (Naylor and Young, 1994; Monderer et al., 2010). Benign LCs usually occur unilaterally, and during sleep (Hensley, 2009).

The prevalence of LC in the non-pregnant population varied according to demographics and is more common in the elderly. The prevalence of LC in the general adult population was reported as 37% while in the elderly group was 54% (Naylor and Young,

1994). A study among the elderly participants in a UK population study reported that about 50% had experienced leg cramps (Abdulla *et al.*, 1999).

The prevalence of LCs in pregnancy ranges from 18.2% to 75%. The lowest prevalence was in Australia while the highest prevalence was in Turkey (Hall *et al.*, 2016; Kesikburun *et al.*, 2018). Pregnant mothers in their second or third trimesters are more affected (Ramachandra *et al.*, 2015; Hensley, 2009). It was previously postulated to be caused by metabolic or electrolyte imbalances such as deficiencies in magnesium, calcium, vitamin B12, folate, or iron (Supakatisant and Phupong, 2015; Zhou *et al.*, 2015).

Another mechanism that could lead to increased frequencies toward the later stages of pregnancy is fluid retention leading to distortion of the neuromuscular junction, weight gain, as well as joint laxity (Miller and Layzer, 2005; Hensley, 2009). This would later lead to the impaired blood supply to lower body organs, and increased pressure on leg muscles during pregnancy. This phenomenon will subside after pregnancy. Nonetheless, not all leg cramps occurring in pregnancy are benign and may need further assessment to rule out other conditions (Hensley, 2009). Differential diagnoses consist of deep vein thrombosis (DVT), post-DVT phlebotic syndrome or co-exist with sleep-related movement disorders such as restless legs syndrome, in which treatments are established. Even though LCs are common in pregnancy, its degree of impact on pregnant mothers is varied. This is because many of them had only brief episodes of LCs, but a substantial of others may experience severe pain that limits their daily activities (Allen and Kirby, 2012).

When associated with sleep disturbance and/or sleep disorders, LCs could stand out as a concomitant risk factor for developing prolonged labour, thus affecting the mode of delivery. In an observational study among 131 pregnant women, it was shown that pregnant women who slept less than six hours per night and those with a severe sleep problem were, respectively, 4.5 times and 5.2 times more likely to undergo a caesarean delivery (Lee and Gay, 2004). If maternal's sleep quality is disturbed, LCs may co-exist to cause some impact on pregnancy outcomes such as increased risks of pregnancy-induced hypertension, pre-eclampsia, gestational diabetes, and depression (Palagini *et al.*, 2014). Consequently, this could lead to prolonged labour, increased caesarean rates and prematurity (Palagini *et al.*, 2014; Lee and Gay, 2004). If LCs are severe enough to cause sleep problems, they can be linked to anxiety and depression, leading to increased

cytokines levels. As a result, this causes an increased risk of early labour with possible fetal asphyxia and postpartum haemorrhage (Dayan *et al.*, 2002; Rondo *et al.*, 2003). Other co-morbidities that LCs have been associated with especially when occurring at night are female sex, leg claudication, angina, arthritis, peripheral neuropathy, peripheral vascular disease and certain medications like statins, diuretics and long-acting beta-blockers (Grandner and Winkelman, 2017).

A Cochrane systematic review on interventions for LCs in pregnancy using magnesium, calcium or vitamin B12 supplements showed inconclusive evidence of their effectiveness (Zhou *et al.*, 2015). A randomized control trial revealed that calcium with vitamin D, or vitamin D alone did not help in reducing the frequency, duration and pain intensity of LC in pregnancy (Mirghafourvand *et al.*, 2017). Non-pharmacological treatment such as leg stretchers or massage also showed limited evidence in treating LCs. How pregnant mothers usually manage their symptoms are also lacking in the literature.

A systematic review showed that pregnant mothers in developed countries had lower QoL due to common symptoms of pregnancy (Lagadec *et al.*, 2018). In pregnant mothers having LCs, it is anticipated that their QoL will be affected due to physical discomfort. Up to now, studies that examine the association of LCs in pregnancy with QoL in developing countries, especially South-East Asia, are few. Taking into account the complications LCs can be related to. This study aimed to explore its magnitude, characteristics and its association with QoL among pregnant mothers who were in their second or third trimesters. We hypothesised that the presence of LCs in pregnancy would reduce the QoL of pregnant mothers. We hope the findings of this study could provide information about the importance of detecting LCs in pregnancy as this condition is commonly underdiagnosed in clinical consultations.

## Methodology

The cross-sectional study was carried out at a suburban government health clinic in the Hulu Langat district, Selangor between March and April 2018. The inclusion criteria for this study were pregnant mothers in the second or third trimester, aged 18 years old and above. Those who were illiterate in both Bahasa Malaysia and English or had an acute problem during their visit were excluded. The sample size was calculated using the Epi Info™ STAT CALC. To answer the primary objective of the study, 112 pregnant mothers were required based on the expected frequency of LCs of 20% (Hall *et al.*, 2016)

from a finite pregnant population of 3000, a margin of error of 7.5%, a confidence level of 95%. This calculation had included consideration of 20% non-responders. Overall, 130 pregnant mothers were conveniently approached, whereby 114 met the inclusion criteria and consented to participate in the study.

### Study tools

This study used bilingual (Bahasa Malaysia and English) self-administered questionnaire that consists of three sections assessing: a) socio-demographic and pregnancy clinical data (b) leg cramps (7 items), c) quality of life using the SF-12v2 questionnaire (12 items).

### Pregnancy clinical data

This section looked at parity, gestational age, and booking BMI. Presence of major medical problems encountered in pregnancy such as diabetes, hypertension, anaemia or kidney problems including urinary tract infections, were also determined to identify confounding factors.

### Leg cramps questionnaire

The section that assessed presence of LCs and their characteristics were developed in dual languages based on literature reviews (Blyton *et al.*, 2012; Hallegraeff *et al.*, 2017) and discussions with an expert panel comprising of two Family Medicine Specialists and a specialist in Obstetrics and Gynaecology for content validity. Presence of leg cramps was assessed through a question: "Have you ever experienced leg cramps during this current pregnancy?" For those who answered "Yes", the descriptions of leg cramps were explored through six items: timing of leg cramps (usually during asleep or awake), the part affected (calf, foot, others), average duration, frequency, pain score and next-day soreness. These data were individually analysed and reported descriptively. The developed questionnaire was subjected to a pre-testing and face validity involving ten pregnant mothers from different socio-demographic backgrounds. Later, it had been piloted in a small group of pregnant women to assess the clarity and comprehensibility of the items. Subsequently, minor changes were made to improve the clarity of the final version of the questionnaire.

### Quality of life questionnaire (SF-12v2)

Permission to use the SF-12v2 was obtained from the copyright holders (Mapi Research Trust and Quality Metric). The respondents' physical and mental well-being during the last four weeks were assessed. It is the shorter version of the SF-36 questionnaire comprising of 12 items, with a completion time of two to three minutes. There are eight sub-

domains including physical functioning (PF), role physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role emotional (RE) and mental health (MH). These subdomains can be summarised into the Physical Component Summary (PCS) and Mental Component Summary (MCS). The Quality Metric Health Outcomes Scoring Software 5.0 was used to calculate the scores of the main domains (PCS and MCS) and the eight subdomains. The mean score of the PCS and MCS domains ranged from 0 (the worst health) to 100 (the best health). The Cronbach alpha of the English-version of SF-12v2 were 0.89 for the PCS-12 and 0.86 for the MCS-12. The Bahasa Malaysia version of SF-12v2 was validated among Malaysian postpartum mothers in Kelantan that showed a Cronbach's alpha of 0.749 for PCS-12 and 0.701 for MCS-12 (Noor and Aziz, 2014). Due to widespread use, having good reliability and validity, availability in both Malay and English language, and shorter completion time (with the same coverage of health domains as SF-36), the SF-12 was chosen for this study.

### Study flow

Respondent recruitment was done once a week on allocated research day (Tuesday) for a duration of 1 month (March to April 2018). Patients' case notes were accessed to clarify parity and BMI (booking and current) and medical illness. Participants who were found to have poor QoL were called for further assessment and intervention. The study flow is shown in Figure 1.

### Data analysis

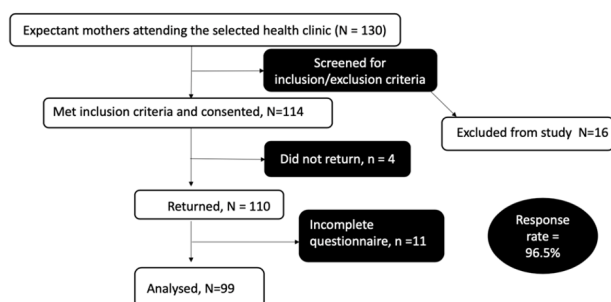
Statistical analysis was performed using the IBM SPSS® version 23.0. Descriptive analysis of all variables was done and presented as number (n) and percentage (%), mean and standard deviation (SD) or median and interquartile range (IQR). Bivariate analysis was performed using the chi-square test or Fisher's Exact test to look for any association between categorical variables. Non-parametric Mann-Whitney U test was used to examine the association between a categorical variable and numerical variable where the data was not normally distributed. Parametric independent t-test was used to look at the association between a categorical variable and numerical variable where the data was normally distributed. Statistical significance was at a p-value of less than 0.05.

## RESULTS AND DISCUSSION

Of the 114 pregnant mothers who met the study criteria and consented, 99 respondents completed the questionnaire. The response rate was 96.5%.

The characteristics of the respondents are shown in Table 1.

As highlighted in Table 2, more than a third of pregnant mothers ever experienced LCs in this current pregnancy (71.7%), which mostly occurred during their sleep (80.3%). About half (50.7%) of them had LCs once to twice a week. LCs were significantly associated with gestational age ( $p = 0.001$ ) and booking BMI ( $p = 0.022$ ) as shown by Table 3. Among the other socio-demographics, pregnancy data and co-morbidities assessed, none were significantly associated with LCs.



**Figure 1: Study flow at the health clinic**

The mean score for the physical component summary (PCS) of QoL was 45.5 (SD 6.4) [the possible range of the total score was between 0 and 100]. About 72% of the pregnant mothers had lower scores than the average of 50. The mean score for the mental component summary (MCS) was 51.8 (SD 7.91) and 58.6% of the pregnant mothers had scores above the average of 50. There was no significant association between the presence of LCs and any QoL components ( $p = 0.675$  for PCS and  $p = 0.118$  for MCS), as shown in Table 4.

This study can be considered as one of the pioneer studies, specifically focusing on LCs among pregnant mothers in Malaysia. In our study, only pregnant mothers in their second or third trimester were included because LCs were previously found to be more common in the later trimesters of pregnancy. A study in India showed that LCs were more common in the second and third trimester (Ramachandra et al., 2015). The statistically significant association between gestational age and LCs was demonstrated in our study as well, demonstrating the similarity of findings in Asian backgrounds. Those with LCs were in their later trimester [median of gestational age: 31 (IQR 10) weeks] compared to those without LC [median gestational age: 27 (IQR 11) weeks]. It is postulated to be due to increased fluid retention or joint laxity toward the third trimester (Miller and Layzer, 2005).

Generally, the respondents in this study were well pregnant mothers, as most of them had no co-

morbid illness. Only 18.2% of them had anaemia, 1% had reported kidney disease (later clarified to be a urinary tract infection), 10.1% had diabetes mellitus or gestational diabetes and 3% had hypertension. Although all these medical problems have been associated with LCs in previous literature, (Hensley, 2009; Miller and Layzer, 2005) but due to the small magnitude of each illness in this study, their associations with LCs were not statistically significant. Alternatively, 30% of the general population in a study reported of having night time LCs with higher frequency (more than five per month). They were significantly associated with co-morbidities like hypertension, diabetes, heart failure, angina, depression and respiratory diseases (Grandner and Winkelmann, 2017). Furthermore, LCs associated with co-morbidities are usually identified as secondary causes, whilst benign LCs in pregnancy are thought to be either idiopathic, metabolic or physiological, which explains the low magnitude of LC co-morbidities in this study.

Many of our pregnant mothers (82.8%) were either overweight or obese at booking (BMI > 23 kg/m<sup>2</sup>). This finding was higher than a local study by Lim et al., 2013 which found that 62.3% of the pregnant population in their study had BMI above 23 kg/m<sup>2</sup>. The average booking BMI of the pregnant mothers in this study was 24.6 kg/m<sup>2</sup>. Studies observing LCs in pregnancy and the association with BMI are still lacking, especially in the South-East Asian region. Our study highlights that LCs may be more common among pregnant mothers who were overweight or obese compared to those with normal weight and the association between BMI and LCs were statistically significant. A similar significant association was found among the non-pregnant general population (Grandner and Winkelmann, 2017). Since overweight and obesity appear to be common among pregnant women, it highlights the importance of healthcare providers to manage the pre-pregnancy weight of the reproductive women before they conceive. Reduction in pre-pregnancy weight might help them to reduce their chances of having LCs during pregnancy. However, further studies are required to prove the effect of reduction in the pre-pregnancy weight on the occurrence of LCs as this study did not examine this effect.

In our study, a large proportion of pregnant women (71.7%) experienced LCs during this current pregnancy. This proportion was slightly lower than the reported study in Turkey (75%) (Kesikburun et al., 2018). Other international studies stated the following prevalences of LCs, i.e. Australia (18.2%), Iran (54.5%), and India (64.6%). A majority of the pregnant mothers in this study (80.3%) sustained

**Table 1: Socio-demographic and pregnancy profile of pregnant mothers (N=99).**

Variables	n (%)	Median (IQR)
Age (years)		30 (4)
Ethnicity		
Malay	63 (63.6)	
Non-Malay	36 (36.4)	
Household income (RM/month)		4000 (3000)
Working status		
Unemployed	24 (24.2)	
Employed	75 (75.8)	
Education Level [n (%)]		
Primary	1 (1.0)	
Secondary	35 (35.4)	
Tertiary	63 (63.6)	
Gestational age (weeks)		30 (11)
Gravida		1 (2)
Booking BMI (kg/m <sup>2</sup> )		24.6 (5.3)
Underweight (< 18.5)	1 (1.0)	
Normal (18.5 - 22.9)	16 (16.2)	
Overweight and obese (> 23)	82 (82.8)	
Co-morbidities		
Anaemia	18 (18.2)	
Kidney problems (UTI*)	1 (1.0)	
Diabetes mellitus	10 (10.1)	
Hypertension	3 (3.0)	

\*UTI = urinary tract infection.

LCs mainly at night time and only 19.7% had it during the day time. A similar occurrence of LCs was observed in a study whereby 88% of the respondents had LC at night only and the remaining 12% had LC both night and day symptoms (Dahle *et al.*, 1995). This is not surprising as the nature of benign LCs mostly does occur at night time. Further evaluation is needed to assess whether the sleep quality of these pregnant mothers is affected to assess the risk of complications in labour outcomes, mode of delivery and fetal compromise.

Even though LCs were common among the pregnant mothers in this study, the description of LCs in terms of its frequency, duration and severity of pain suggests that LCs might be tolerable by them. They appeared to have less frequent LCs compared to the pregnant women in two randomised control trials (Dahle *et al.*, 1995; Mirghafourvand *et al.*, 2017). In our study, about half of the pregnant mothers had once to twice LCs in a week. However, before starting the intervention, about 80% of the pregnant mothers had three or more LCs in a week (Dahle *et al.*, 1995), whereas the pregnant women in another study reported an average of 5

to 6 LCs per week (Mirghafourvand *et al.*, 2017). Nevertheless, the frequency of LCs in the current study was more than the general Americans; which reported that the majority of their participants had LCs less than once a week (Naylor and Young, 1994).

The average duration of LCs described by our pregnant mothers was two minutes and 63.4% of them had moderately painful LCs based on the visual analogue scale (VAS). A similar description of LCs was found in a previous study; in which the duration of the LCs before the intervention was between 1.6 and 4.3 minutes and the pain score based on VAS was between 4.9 and 5.1 indicating moderate pain (Mirghafourvand *et al.*, 2017). In addition, 26.7% of our pregnant mothers suffered severe LCs with VAS of 7 or more; thus, their LCs should not be disregarded. This suggests that although LCs may be assumed as benign in most cases, it is still worthwhile to be elicited during history taking, especially in their second to third trimesters. This is because some pregnant mothers may not reveal their LC symptoms to healthcare providers without being prompted. Furthermore, it is important to ensure that there are no secondary causes or con-

**Table 2: Leg cramps profile of pregnant mothers with leg cramps (N=71)**

Leg cramps characteristics	n (%)	Median (IQR)
Presence of leg cramps		
Yes	71 (71.7)	
No	28 (28.3)	
Timing of leg cramps		
Usually during sleep	57 (80.3)	
Usually during awake	14 (19.7)	
Pain score		
Mild (1-3)	7 (9.9)	
Moderate (4-6)	45 (63.4)	
Severe (7-10)	19 (26.7)	
Duration (Minute)		2 (3)
Frequency of leg cramps		
Less than once a week	26 (36.6)	
Once or twice a week	36 (50.7)	
Three times a week	7 (9.9)	
More than three times a week	2 (2.8)	
Next-day soreness		
Never	10 (14.0)	
Rarely	21 (29.6)	
Sometimes	31 (43.7)	
Most of the time	6 (8.5)	
Always	3 (4.2)	
Affected area		
Calf	59 (83.0)	
Foot	6 (8.5)	
Others	6 (8.5)	

comitant conditions with LCs in pregnancy, such as DVT, or sleep disorders that require urgent attention or proper treatment.

The physical impacts of LCs on the pregnant mothers in this study appears to be mild as most of them (43.6%) had never or rarely experienced next-day soreness. Next-day soreness only occurred 'sometimes' for many of them (43.7%). This finding is contrary to previous findings, whereby 40% of their pregnant women reported to 'always' have next-day soreness (Dahle *et al.*, 1995). About 34.3% of them experienced the soreness in some of the time and 25.7% of them denied having the next-day symptoms. However, 12.7% of the pregnant mothers in this study were substantially affected by the next-day soreness and they may need treatment to alleviate LC.

Majority of the pregnant mothers (71.7%) experienced below-average physical well-being, but many had above average mental well-being (58.6%). A study was carried out comparing the QoL pregnant

mothers of all trimesters, in the urban and rural areas in Islamabad, Pakistan, using the SF-12 questionnaire (Naseem *et al.*, 2011). It was found that the mean PCS and MCS scores for the urban group were 49.87 (SD 22.27) and 58.07 (SD 15.07), respectively. In this present study, the mean PCS and MCS scores were 45.4 (SD 6.4) and 51.8 (SD 7.9) sequentially. Considering possible similarities of sub-urban and urban backgrounds, the findings of this study were consistent with findings from (Naseem *et al.*, 2011); where the mean MCS score was relatively higher than the mean PCS score. The pregnant mothers in this study can be assumed to have reasonably good mental health capacity to endure the physical discomforts of their pregnancy, including LCs. To add to that, the presence of LCs in this study was insignificantly associated with the QoL of pregnant mothers. Because LCs in this study were perceived as tolerable, it reflects why their QoL was not affected. This would conform with some theories of psychological empowerment of pain management. However, caution must be observed to assess whether these preg-

**Table 3: Association of socio-demographic data, pregnancy profile and presence of leg cramps.**

Variables	Overall (N=99)	With leg cramps (n=71)	Without leg cramps (n=28)	p-value
Age (years) [Median (IQR)]	30 (4)	30 (5)	31 (7)	0.158a
Ethnicity [n (%)]				
Malay	63 (63.6)	45 (71.4)	18 (28.6)	0.933c
Non-Malay	36 (36.4)	26 (72.2)	10 (27.8)	
Income (RM/month) [Median (IQR)]	4000 (3000)	4000 (3000)	4000 (3238)	0.600a
Working status				
Unemployed	24 (24.2)	16 (66.7)	8 (33.3)	0.528c
Employed	75 (75.8)	55 (73.3)	20 (26.7)	
Education Level [n (%)]				
Primary	1 (1.0)	0 (0.0)	1 (100)	0.210d
Secondary	35 (35.4)	27 (77.1)	8 (22.9)	
Tertiary	63 (63.6)	44 (69.8)	19 (30.2)	
Gestational age (weeks) [Median (IQR)]	30 (11)	31 (10)	27 (11)	0.001a
Gravida [Median (IQR)]	1 (2)	1(2)	1(2)	0.922a
Booking BMI (kg/m <sup>2</sup> )	24.6 (5.3)			
Underweight (< 18.5)	1 (1.0)	1 (100.0)	0 (0.0)	0.022c
Normal (18.5 - 22.9)	16 (16.2)	7 (43.8)	9 (56.2)	
Overweight and obese (> 23)	82 (82.8)	63 (76.8)	19 (23.2)	
Co-morbidities [n (%)]				
Anaemia	18 (18.2)	11 (61.1)	7 (38.9)	0.269c
Kidney problems (UTI)*	1 (1.0)	1 (100)	0 (0)	1.000d
Diabetes mellitus	10 (10.1)	7 (70.0)	3 (30.0)	1.000d
Hypertension	3 (3.0)	2 (66.7)	1 (33.3)	1.000d

a: Mann-Whitney test, c: Chi-square test, d: Fisher's exact test, p-value significant at <0.05.

\*UTI = urinary tract infection.

**Table 4: Association of the presence of leg cramps with QoL of pregnant mothers.**

Variables	Overall (N=99)	With leg cramps (n=71)	Without leg cramps (n=28)	p-value
QoL				
PCS score [Mean, (SD)]	45.5 (6.4)	45.7 (6.2)	45.1 (7.0)	0.675b
PCS [n, (%)]	28 (28.3)	21 (75.0)	7 (25.0)	0.649c
Above average	71 (71.7)	50 (70.4)	21 (29.6)	
Below average				
MCS score [Mean, (SD)]	51.8 (7.9)	51.0 (8.2)	53.8 (6.9)	0.118b
MCS [n, (%)]	58 (58.6)	40 (69.0)	18 (31.0)	0.470c
Above average	41 (41.4)	31 (75.6)	10 (24.4)	
Below average				

a: Mann-Whitney test, b:Independent t-test, c: Chi-square test. p-value significant at < 0.05.

Note: The mean score of the physical component summary (PCS) and mental health summary (MCS) domains ranged from 0 (the worst health) to 100 (the best health).

nant mothers would go on to perceive pain similarly throughout the whole pregnancy. In serial consultations, it is important to evaluate whether the LC symptoms have worsened which could jeopardize their QoL.

## CONCLUSIONS

Leg cramps (LCs) appear to be common in pregnancy as the majority of pregnant mothers in this study did experience LCs which were brief, mild and infrequent. An insignificant association between LCs with QoL was found in this study, contrary to our hypothesis. Despite this, LCs should not be disregarded, as a subgroup of pregnant mothers experienced severe LCs with next-day soreness.

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## Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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## REFERENCES

- Abdulla, A. J., Jones, P. W., Pearce, V. R. 1999. Leg cramps in the elderly: prevalence, drug and disease associations. *International journal of clinical practice*, 53(7):494-496.
- Allen, R. E., Kirby, K. A. 2012. Nocturnal leg cramps. *American family physician*, 86(4):350-355.
- Blyton, F., Chuter, V., Burns, J. 2012. Unknotting night-time muscle cramp: a survey of patient experience, help-seeking behaviour and perceived treatment effectiveness. *Journal of Foot and Ankle Research*, 5(1):1-7.
- Dahle, L. O., Berg, G., Hammar, M., Hurtig, M., Larsson, L. 1995. The effect of oral magnesium substitution on pregnancy-induced leg cramps. *American Journal of Obstetrics and Gynecology*, 173(1):175-180.
- Dayan, J., Creveuil, C., Herlicoviez, M., Herbel, C., Baranger, E., Savoye, C., Thouin, A. 2002. Role of anxiety and depression in the onset of spontaneous preterm labour. *American Journal of Epidemiology*, 155(4):293-301.
- Grandner, M. A., Winkelman, J. W. 2017. Nocturnal leg cramps: Prevalence and associations with demographics, sleep disturbance symptoms, medical conditions, and cardiometabolic risk factors. *Plos One*, 12(6).
- Hall, H., Lauche, R., Adams, J., Steel, A., Broom, A., Sibbritt, D. 2016. Healthcare utilisation of pregnant women who experience sciatica, leg cramps and/or varicose veins: A cross-sectional survey of 1835 pregnant women. *Women and Birth*, 29(1):35-40.
- Hallegraef, J., de Greef, M., Krijnen, W., van der Schans, C. 2017. Criteria in diagnosing nocturnal leg cramps: a systematic review. *BMC Family Practice*, 18(1):1-29.
- Hensley, J. G. 2009. Leg Cramps and Restless Legs Syndrome During Pregnancy. *Journal of Midwifery and Women's Health*, 54(3):211-218.
- Kesikburun, S., Güzelküçük, Ü., Fidan, U., Demir, Y., Ergün, A., Tan, A. K. 2018. Musculoskeletal pain and symptoms in pregnancy: a descriptive study. *Therapeutic Advances in Musculoskeletal Disease*, 10(12):229-234.
- Lagadec, N., Steinecker, M., Kapassi, A., Magnier, A. M., Chastang, J., Robert, S., Gaouaou, N., Ibanez, G. 2018. Factors influencing the quality of life of pregnant women: a systematic review. *BMC Pregnancy and Childbirth*, 18(1):455.
- Lee, K. A., Gay, C. L. 2004. Sleep in late pregnancy predicts length of labor and type of delivery. *American Journal of Obstetrics and Gynecology*, 191(6):2041-2046.
- Miller, T. M., Layzer, R. B. 2005. Muscle cramps. *Muscle and Nerve: Official Journal of the American Association of Electrodiagnostic Medicine*, 32(4):431-442.
- Mirghafourvand, M., Mansouri, A., Charandabi, S. A., Najafi, M. 2017. The effect of Vitamin D and calcium plus Vitamin D on leg cramps in pregnant women: A randomized controlled trial. *Journal of Research in Medical Sciences*, 22.
- Monderer, R. S., Wu, W. P., Thorpy, M. J. 2010. Nocturnal Leg Cramps. *Current Neurology and Neuroscience Reports*, 10(1):53-59.
- Naseem, K., Khurshid, S., Khan, S. F., Moeen, A., Farooq, M. U., Sheikh, S., Bajwa, S., Tariq, N., Yawar, A. 2011. Health-related quality of life in pregnant women: a comparison between urban and rural

- populations. *JPMA. The Journal of the Pakistan Medical Association*, 61(3):308–312.
- Naylor, J. R., Young, J. B. 1994. A General Population Survey of Rest Cramps. *Age and Ageing*, 23(5):418–420.
- Noor, N. M., Aziz, A. A. 2014. Validity and reliability of the Malay version of the 12-item short-form health survey among postpartum mothers. *Malaysian Journal of Public Health Medicine*, 14(2):56–66.
- Palagini, L., Gemignani, A., Banti, S., Manconi, M., Mauri, M., Riemann, D. 2014. Chronic sleep loss during pregnancy as a determinant of stress: impact on pregnancy outcome. *Sleep Medicine*, 15(8):853–859.
- Ramachandra, P., Maiya, A. G., Kumar, P., Kamath, A. 2015. Prevalence of Musculoskeletal Dysfunctions among Indian Pregnant Women. *Journal of Pregnancy*, 2015.
- Rondo, P. H. C., Ferreira, R. F., Nogueira, F., Ribeiro, M. C. N., Lobert, H., Artes, R. 2003. Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. *European Journal of Clinical Nutrition*, 57(2):266–272.
- Supakatisant, C., Phupong, V. 2015. Oral magnesium for relief in pregnancy-induced leg cramps: A randomised controlled trial. *Maternal and Child Nutrition*, 11(2):139–145.
- Zhou, K., West, H. M., Zhang, J., Xu, L., Li, W. 2015. Interventions for leg cramps in pregnancy. *Cochrane Database of Systematic Reviews*, 8.