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SURVEY ON LOW BACK PAIN AMONG CYCLISTS: PREVALENCE, RISK FACTORS AND KNOWLEDGE OF INJURY PREVENTION STRATEGIES

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Abstract

The study aimed to determine prevalence of low back pain (LBP), risk factors, and knowledge of injury prevention strategies in recreational cyclists.

Materials and methods. This cross-sectional quantitative study included 141 adult recreational cyclists aged 18 to 70. LBP prevalence was determined using a standard Nordic questionnaire. In addition, a validated self-developed questionnaire was used to assess knowledge level, with a high score representing the highest level of knowledge. Frequencies and percentages were used to report the descriptive variables, whereas the Chi-square test was used to determine the association between risk factors and LBP.

Results. The study identified that 55.3% of cyclists had a lifetime prevalence of LBP, and 35.5% reported LBP in the past 12 months. However, no significant association ($p>0.05$) was found between the risk factor and the LBP. Despite this, a low level of knowledge of injury prevention strategies for recreational cyclists was found.

Conclusions. This survey found that recreational cyclists have a low level of understanding about crucial bicycle characteristics such as seat height, saddle tilt, and handlebar position to maintain optimal body biomechanics. Recreational cyclists should be educated on the need for appropriate bicycle modifications and ergonomics, effective warm-up, stretching, and cool-down techniques, and some critical injury prevention strategies, especially in the low back.

Keywords: cyclist, low back pain, knowledge, risk factors, injury prevention.

Introduction

Cycling is one of the most popular activities worldwide due to its physical and mental health advantages (Decock et al., 2016; Oja et al., 2011). Additionally, cycling has been linked to a decreased risk of type 2 diabetes, cardiovascular disease, cancer, and obesity (Antequera-Vique et al., 2022; Nordengen et al., 2019). Cycling also offers the extra benefit of not being connected to repetitive joint impact.

Despite the fact that cycling is considered a safe and low-impact activity, a number of acute, chronic and overuse injuries have been linked to its practice (Dinu et al., 2019; Rasmussen et al., 2016). In regard to overuse injuries, low back pain (LBP) has been reported as one of the areas with a high prevalence of injuries in recent studies among recreational cyclists (11.5%) (Francois Du Toit et al., 2020), mountain bikers (23%) (Lebec et al., 2014), and road cyclists (45%) (Priego Quesada et al., 2019).

Cycling is one such activity where the cyclist's stance, with a protracted flexed posture, may have an impact on the morphology of the spine and may result in greater mechanical strain on the lumbar region, resulting in low back discomfort (Antequera-Vique et al., 2022; Marsden, 2010). Furthermore, cycling requires riders to assume postures that are deemed unnatural based on the needs of trunk flexion in order to complete a specific technical move that enhances

sports performance (Antequera-Vique et al., 2022) such as adapting the spinal curvatures on the bicycle depending on the handlebar type and position on the handlebars. Another systematic review have also reported that cycling-related prolonged lumbopelvic flexion, imbalances in the activation of the core and spinal muscles, and lower handlebar posture can all induce lower back pain in cyclists (Streisfeld et al., 2017).

The bicycle's components should be adjusted to the rider's body measurements for efficient cycling such as seat height, seat tube angle, body posture, and crank length (Bini & Hunter, 2021). The handlebars, pedals, and seat are some of the points of contact where the mechanical movements of the muscles are transferred to the bicycle while cycling (Bini & Hunter, 2021; Turpin & Watier, 2020). Certain positions adopted by the cyclist may predispose to overuse injury. Nevertheless, there is little knowledge among cyclists of the appropriate cycle ergonomics to prevent injuries (Bini & Hunter, 2021). For example, one study has reported on the lack of knowledge on the saddle position in relation to pedals based on scientific knowledge as improper position of the saddle could lead to overuse injuries (Peveler et al., 2005; Wanich et al., 2007). Besides, different handle heights result in a variety of riding postures that may alter the cervical and lumbar curves (Chen & He, 2012). Thus, cyclists should be made aware of the importance of proper cycle ergonomics to prevent overuse injuries in the long term and improve overall fitness and performance during the activity.

Several studies were conducted on cyclists to identify the incidence of injury, factors affecting performance, and modifications in the components of the cycle. LBP is one of the factors causing cyclists to stop participating in the sport, which hinders them from gaining the benefits of cycling (François du Toit et al., 2020). However, there is a dearth of studies examining the prevalence of LBP and the level of knowledge of its preventative strategies among Malaysian recreational cyclists. Hence, this study aimed to determine the prevalence, association between risk factors, and knowledge level among recreational cyclists in Malaysia.

Materials and methods

Study participants

This study was a cross-sectional study conducted among 141 recreational cyclists in various cycling clubs in the Klang Valley, Malaysia. The study included participants ranging in age from 18 to 70 years old and of both genders. Participants who do not understand the English language, competitive cyclists, and bicycle commuters were excluded from the study. Prior to the study, ethical approval was obtained from INTI International University Ethics and Research committee with reference number: INTI/UEC/2021/001. Considering the population size of recreational cyclists in various running clubs in the Klang Valley, confidence level (95%), and acceptable margin of error (5%), a sample size of 200 recreational runners was selected using simple random sampling methods. Of the 200 questionnaires administered, 141 completed questionnaires were returned, demonstrating a 70% response rate. Participants were informed of the study objective, the confidentiality of their data, and their anonymity in the research. They were then required to sign an informed consent form before proceeding with the questionnaire. All participation in this research was completely voluntary, and the participants were allowed to withdraw from the research at any time without giving a reason.

Study organization

This study designed a self-structured questionnaire concerning recreational cyclists. It has four sections: i) Demographic information on recreational cyclists, ii) Risk factors for LBP among recreational cyclists, iii) Knowledge about low back pain preventive strategies adopted by the cyclists, and iv) Prevalence of LBP. Specifically, all items of the prevalence of the LBP section were retrieved by adopting the modified Nordic questionnaire. The content validity of the self-developed questionnaire has been assessed using professional judgment by experts in physiotherapy and rehabilitation. Since all recreational riders were members of various cycling groups, the data were collected using "Google forms."

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 28.0.0 was used to conduct the statistical analysis. Knowledge of LBP strategies was analysed using multiple-choice questions with one or multiple correct answers for each question. Descriptive analysis was used to evaluate demographic data and the level of knowledge of LBP prevention strategies, represented in frequency and percentage. The chi-square test was used to interpret the association between risk factors and LBP.

Results

141 respondents took part in the current survey. Table 1 provided information about the respondents demographic details.

The analysis of low back pain revealed that 55.3% of cyclists had developed back pain. Furthermore, 35.5% of people reported low back pain in the previous 12 months, and 14.2% reported it in the previous 7 days.

Table 3 shows the association between risk factors and LBP. Although, high frequencies were seen in lack of warm up and cool down, no association were found between the variables.

The study's findings addressed the cyclists' knowledge about the LBP prevention strategies and the correctness of responses to the knowledge-related variable, as shown in Table 4. Specifically, the respondents' knowledge of saddle and tilt angle was only 14.9% and 3.54%, respectively. However, 80.14% of respondents were more knowledgeable about exercise to reduce LBP. In addition, nearly half (48.93%) of them correctly recognized the perfect handlebar position to reduce LBP, and only 19.14% knew the optimal riding distance for a cyclist to prevent the incidence of LBP, as shown in Table 4.

Further exploration was carried out to ascertain whether the participating cyclists' knowledge of LBA prevention strategies is one of the factors in preventing LBA. Table 5 shows the association between the cyclists' knowledge

Table 1. Demographic Characteristics

Variables		Mean ± SD	n (%)
Age	18-30		39 (27.7)
	31-50		81 (57.4)
	51-70		21 (14.9)
Gender	Female		22 (15.6)
	Male		119 (84.4)
BMI		24.86 ± 3.97	
Riding Speed (Km/h)		27.91 ± 4.96	
Educational Level	Primary		2 (1.4)
	Secondary		14 (9.9)
	Diploma		30 (21.3)
	Pre-university		4 (2.8)
	Undergraduate		45 (31.9)
	Postgraduate		42 (29.8)
	PhD		4 (2.8)
Cycling Experience	< 6 months		5 (3.5)
	6 months - 1 year		18 (12.8)
	1 year - 2 years		23 (16.3)
	2 years - 3 years		20 (14.2)
	> 3 years		75 (53.2)

All the data presented in frequencies (percentage) except BMI and riding speed presented in mean ± SD, BMI: Body mass index, SD: Standard Deviation

Table 2. Prevalence of Low Back Pain

Variable		n (%)
Lifetime Prevalence		
	Yes	78 (55.3)
	No	63 (44.7)
LBP from cycling in the past 12 months		
	Yes	50 (35.5)
	No	91 (64.50)
LBP from cycling at present		
	Yes	20 (14.2)
	No	121 (85.8)

*LBP-Low back pain

about bicycle seat adjustment, saddle title angle, best cycle design, handlebar position, optimal cycle distance, core muscle exercises, and the annual prevalence of LBA. Except for the cyclists' knowledge about saddle tilt angle, all the other factors are significantly associated with the annual prevalence of LBA.

Discussion

The current study aimed to determine the prevalence, risk factors, and level of knowledge of LBP prevention strategies among Malaysian recreational cyclists. According to the study's statistics, 35.5% of cyclists reported having LBP in the past 12 months. The results of the current study are also concurrent with a previous study that reported a prevalence of 41% of LBP among amateur cyclists (Van der

Table 3. Association between risk factor and LBP

Risk factors		LBP in the past 12 months			χ^2	p-value
		Total	No	Yes		
		n (%)	n (%)	n (%)		
Riding terrains					6.960	0.138
	Flat with few hills	58 (41.1)	44 (31.2)	14 (9.9)		
	Downhill	1 (0.7)	1 (0.7)	0		
	Flat roads	19 (13.5)	11 (7.8)	8 (5.7)		
	Hilly roads	58 (41.1)	33 (23.4)	25 (17.7)		
	Uphill	5 (3.5)	2 (1.4)	3 (2.1)		
Smoking					0.338	0.561
	Yes	21 (15.6)	13 (9.2)	9 (6.4)		
	No	119 (84.4)	78 (55.3)	41 (29.1)		
Supplementary exercise					0.201	0.654
	Yes	104 (73.8)	66 (46.8)	38 (27.0)		
	No	37 (26.2)	25(17.7)	12 (8.5)		
Warm-up					2.754	0.097
	Yes	77 (54.6)	45 (31.9)	32 (22.7)		
	No	64 (45.4)	46 (32.6)	18 (12.8)		
Cool-down					0.603	0.806
	Yes	64 (54.6)	42 (29.8)	22 (15.6)		
	No	77 (54.6)	49 (29.8)	28 (19.9)		
Other sports					2.223	0.136
	Yes	85 (60.2)	59 (41.8)	26 (18.4)		
	No	56 (39.7)	32 (22.7)	24 (17.0)		

*LBP-Low back pain, χ^2 – Effect size

Table 4. Cyclist Knowledge on LBP prevention strategies

Item	N (%)
Knowledge on saddle angle	21 (14.89)
Knowledge on saddle tilt angle	5 (3.54)
Knowledge on best bicycle design	53 (37.58)
Knowledge on core muscle exercises	113 (80.14)
Knowledge on handlebar position	69 (48.93)
Knowledge on optimal distance for cycling	27 (19.14)

*LBP-Low back pain

Table 5. Association between Cyclists' knowledge about LBP prevention strategies and the annual prevalence of low back pain.

Risk factors	LBP in the past 12 months			
	Total	No	Yes	χ^2
	n (%)	n (%)	n (%)	(p-value)
Knowledge about Seat Adjustment				
Correct Response	21 (15)	19 (19)	2 (8)	6.6064
Incorrect Response	120 (85)	74 (81)	46 (92)	(p>0.05)
Knowledge about saddle tilt angle				
Correct Response	5	3	2	
Incorrect Response	136	87	49	0.4975 (p<0.05)
Knowledge on best bicycle design				
Correct Response	53	42	11	8.025
Incorrect Response	88	49	39	(p>0.05)
Knowledge on core muscle exercises				
Correct Response	113	80	14	52.1235
Incorrect Response	28	11	36	(p>0.05)
Knowledge on handlebar position				
Correct Response	69	79	6	73.1225*
Incorrect Response	72	12	44	(p>0.05)
Knowledge on optimal distance for cycling				
Correct Response	27	75	9	55.6013*
Incorrect Response	114	16	41	(p>0.05)

*LBP-Low back pain, χ^2 – Effect size

Walt et al., 2014). Nevertheless, the incidence of mechanical LBP was comparatively lower (13.5%) in top-level road cyclists (De Bernardo et al., 2012) and world-class cyclists (13.4%) (Barrios et al., 2015). The possible reason may be that the targeted population was different in the current study and the training pattern may vary in professional cyclists. This evidence stands to reason because, in comparison to recreational road cyclists, professional road cyclists typically have greater average cycling speeds, distances, and frequencies per week, which may decrease the risk of low back pain (Priego Quesada et al., 2018; Teyeme et al., 2019).

In the Klang Valley, 14.2% of recreational cyclists reported having LBP at the time of the survey. In a similar survey, 16% of road cyclists reported low back pain at the time of the survey (Clarsen, 2015). The point-prevalence of low back pain in the two sample populations is comparable as a result of their similarities. This supports the study's findings and shows that LBP is a common problem among recreational road cyclists. Maintaining a fixed riding posture, utilising high gears, climbing hills for a lengthy amount of time, and stressing gluteal, hamstring, and back muscles are all thought to be factors in LBP in cyclists (Mellion, 1994).

Our study found no significant association between the riding terrain and LBP. This result supports that of an earlier study that evaluated the prevalence of low back discomfort among cyclists riding on "mostly flat", "primarily hilly", and "flat with rolling hills" terrains. This study found that low back pain in recreational cyclists is not significantly linked to the different types of cycling terrain (Schultz & Gordon, 2010). Although there is no remarkable relationship between LBP and terrain, ongoing research on cycling biomechanics has revealed that uphill cycling requires a significant amount of power to defy gravity. Cycling uphill has a different posture than cycling on flat ground (Fonda & Šarabon, 2012). In this study, the majority of the participants are non-smokers and they adopt a healthy lifestyle. In contrast, recent evidence adopted from a study stated that cigarette smoking contributed to one of the risk factors for chronic LBP in university athletes (Ansari & Sharma, 2022). Another interesting finding in this study was that there was no relationship between LBP and exercise. Since a substantial number of participants in this survey do exercise to prevent LBP, this may be the possible reason for the non-significant relationship. However, a dissimilar result was illustrated in the study investigated by Rostami et al., 2015 revealed that deficiency of core stability muscles leads to LBP in bikers. Therefore, core stability exercises may be beneficial for mountain bikers.

In this survey, cyclists had a low level of knowledge about LBP prevention strategies. Only 14.9%, 3.5%, and 19.1% of the respondents provided correct answers for optimal position on saddle angle, saddle tilt, and optimal distance for recreational cyclists, respectively. Despite the low level of knowledge, the other components of the questionnaire, such as the importance of suspension in the cycle, core muscle exercise, and handlebar position, more than half of the respondents have a moderate level of knowledge of prevention strategies. Unlike previous studies, this study established a significant association between the cyclists' knowledge about bicycle seat adjustment, best cycle design, handlebar position, optimal cycle distance, core muscle exercises, and the annual prevalence of LBA. Nevertheless, our findings reveal cyclists' knowledge about saddle tilt angle does not show any association with the annual prevalence of LBP. However, an earlier study indicated that cyclists' appropriate adjustment of the saddle angle resulted in a major improvement in the incidence and magnitude of their back pain (Salai et al., 1999).

Thus, inadequate knowledge of bicycle parameters would be one of the contributing factors to the prevalence of LBP in cyclists as demonstrated through this study. No study has looked into cyclists' awareness of back pain prevention methods as of yet. The fundamental understanding of injury among cyclist varies, with some showing a higher level of understanding than others. However, cyclist' understanding tends to improve with time and with experience (Rees et al., 2022).

Some limitations of the study include inherent issues of self-reported surveys. This study's results are derived from a self-reported survey of recreational cyclists about their prevalence, risk factors, and injury prevention strategies. Therefore, independent verification of data was not possible. The study captured the prevalence, risk factors, and

injury prevention strategies from the voice of recreational cyclists in various cycling clubs in the Klang Valley, Malaysia. Therefore, the perceptions cannot be generalized to cyclists in Malaysia. Therefore, future studies should include a broader population of cyclists across Malaysia to generalize the findings.

Conclusions

In conclusion, the survey's findings indicate that recreational bikers know little about aspects of bicycles, including saddle height, saddle tilt, and handlebar position. Furthermore, there is an association between the cyclists' knowledge about LBP prevention strategies focusing on bicycle adjustments & core muscle exercises and the annual prevalence of low back pain. Therefore, it is important to emphasize the need for education on proper bicycle modifications for recreational riders to lower the prevalence of LBP. Despite the fact that the vast majority of research participants regularly strengthen their core muscles, LBP is nevertheless somewhat more common than average. Therefore, the community of recreational cyclists needs to emphasize adequate education and knowledge of bicycle adjustment and the proper method to perform core muscle exercise.

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Conflict of interest

No potential conflict of interest was reported by the author(s).

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ОПИТУВАННЯ ПРО БІЛЬ У ПОПЕРЕКУ СЕРЕД ВЕЛОСИПЕДИСТІВ: ПОШИРЕНІСТЬ, ФАКТОРИ РИЗИКУ ТА ЗНАННЯ СТРАТЕГІЙ ЗАПОБІГАННЯ ТРАВМАТИЗМУ

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 7 с., 5 табл., 30 джерел.

Метою дослідження було визначити поширеність болю в попереку (БП), фактори ризику та знання стратегій запобігання травмам у велосипедистів-любителів.

Матеріали та методи. У цьому перехресному кількісному дослідженні взяли участь 141 дорослий велосипедист-любитель віком від 18 до 70 років. Поширеність БП визначали за допомогою стандартного Скандинавського опитувальника. Крім того, для оцінки рівня знань використовували валідований самостійно розроблений опитувальник, при цьому високий бал представляв найвищий рівень знань. Для приведення описових змінних використовували частоти та відсотки, тоді як для визначення зв'язку між факторами ризику та БП використовували критерій хі-квадрат.

Результати. За результатами дослідження було визначено, що 55,3% велосипедистів мали БП протягом усього життя, а 35,5% повідомили про БП протягом останніх 12 місяців. Однак між фактором ризику та БП не було виявлено статистично значущого зв'язку (p>0,05). Незважаючи на це, було виявлено низький рівень знань про стратегії запобігання травматизму для велосипедистів-любителів.

Висновки. Це опитування показало, що велосипедисти-любителі мають низький рівень розуміння важливих характеристик велосипеда, таких як висота сидіння, нахил сідла та положення керма, для підтримання оптимальної біо-

механіки тіла. Велосипедисти-любителів слід навчати необхідності відповідних модифікацій велосипеда та ергономіки, ефективних технік розминки, розтяжки та охолодження, а також деяких важливих стратегій запобігання травмам, особливо попереку.

Ключові слова: велосипедист, біль у попереку, знання, фактори ризику, профілактика травм.

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