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The relationship between sitting duration and piriformis syndrome in handcrafters

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ABSTRACT

Background: Handcrafters of *serati banten* are professionals at risk of developing piriformis syndrome. This can happen because *serati banten's* working position is sitting for a long time. If this position is carried out continuously for a long period, it can cause musculoskeletal symptoms, namely piriformis syndrome. This study aimed to determine the relationship between sitting duration and piriformis syndrome in handcrafters of *serati banten*.
Methods: This research was an analytical observational study with a cross-sectional study design conducted from June to December 2023. Sampling was done using a purposive sampling technique with a total sample of 106 people in this study. This study's inclusion criteria were handcrafters of serati banten aged 45 to 55. The exclusion criteria included experiencing low back pain. The independent variable measured was sitting duration, determined by filling in the questionnaire, and the dependent variable measured was piriformis syndrome, calculated using the flexion adduction internal rotation test, active piriformis test, and pace test.
Results: Based on the chi-square test results, the value of p=0.003 (p<0.05) was obtained, meaning a significant relationship exists.
Conclusion: There was a significant relationship between sitting duration and piriformis syndrome in handcrafters of *serati banten*.

Keywords: handcrafters of *serati banten*, piriformis syndrome, sitting duration, working position.
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INTRODUCTION

Handcrafters of *serati banten* are community figures with a very important role in society, especially in every Hindu religious ceremony.[1] The main focus of a *serati banten* in contributing to religious ceremonies is making *banten*. The quality of the *banten* depends on how complex the type of *banten* needed is according to the kind of religious ceremony; in other words, the bigger the ceremony, the more types of *banten* there are, and the longer the work on the *banten*. Handcrafters in *serati banten* labor for 9 hours, with 1 hour of rest, and sit for an average of 5 hours daily. Prolonged sitting can cause spasms in the piriformis muscle, leading to compression of the sciatic nerve, known as piriformis syndrome.[2,3]

Sitting is an upright position with the head and torso in a straight line, the lower legs bent at the hips and knees to about 90 degrees, and the feet flat on the floor.[4,5] Sitting for an average of 5 hours over a long period can cause the piriformis muscle to contract continuously to maintain a sitting position and remain active during all types of sitting positions, whether sitting high or sitting cross-legged, even though the function changes in different sitting styles so that the muscle experiences inflammation which causes muscle tightness and then finally muscle spasm so that these conditions over a long period cause piriformis syndrome.[3,6,7]

Unergonomic work postures lead muscles to contract continually, resulting in muscular tension or shortening.[8] Previous studies indicate prolonged chair sitting increases passive back muscular stiffness. Research suggests that chair-sitting's low muscular activity and static postures hinder muscle metabolism, negatively impacting blood flow, oxygenation, and inflammatory regulation. Prolonged sitting can raise the risk of metabolic and chronic cardiovascular illnesses, as well as mortality.[9]

Many handcrafters of *serati banten* report pain and numbness in their buttocks after prolonged sitting. This is one of the clinical symptoms of piriformis syndrome.[7,10] Given the increasing number of complaints of buttock pain due to piriformis syndrome in *serati banten* and considering that piriformis syndrome can create discomfort while working, which risks decreasing the work productivity of *serati banten*, researchers are interested in knowing the relationship between sitting duration and piriformis syndrome in *serati banten* in Gianyar Regency so that appropriate prevention can be carried out.

METHODS

This study was conducted at non-formal Hidus's schools, holy monks' houses, and markets in Gianyar, Bali, from June to December 2023, with a target population of handcrafters of *serati banten*. This

quantitative, analytic observational study used a cross-sectional approach to examine the relationship between events objectively.

The inclusion criteria consisted of working as *serati banten*, aged 40-55 years, working in a sitting position, and being willing to be a research subject from the beginning to the end of the study by signing an agreement after explanation (PSP) or informed consent; and understanding the research instructions, and the exclusion criteria consisted of experiencing low back pain (LBP, HNP, Sciatica); having a history of microtrauma falling in a sitting position; post-op fracture in the last two years in the hip and pelvis area.

The sampling technique used was purposive sampling, namely non-probability sampling, with the sampling formula used Lemeshow with a total sample of 106 people. The sample was then examined using several piriformis syndrome tests: the FAIR, Active Piriformis, and Pace Test. The data were then analyzed using univariate and bivariate analysis with the chi-square correlation test. The Research Ethics Commission of the Faculty of Medicine, Universitas Udayana, approved this study under registration number 2360/UN14.2.2.VII.14/LT/2023. Informed consent was also obtained from survey respondents, who approved sampling.

RESULTS

After data collection, listed in Table 1, a total of 106 samples were obtained that met the inclusion and exclusion criteria with an average age of 49.71 years, with the highest number of people aged 46 years, as many as 17 people (16%), 35 people (33%) were male, and 71 people (67%) were female. A total of 45 people (42.5%) sat with a duration of <5 hours, and 61 people (57.5%) sat with a duration of ≥5 hours.

After several examinations on 106 samples, the results of the Active Piriformis Test showed that as many as 44 people (41.5%) did not complain of piriformis syndrome, and 62 people (58.5%) complained of piriformis syndrome. The results of the Pace Test show that as many as 27 people (25.5%) do not complain of piriformis syndrome, and 79 people (74.5%) complain of piriformis syndrome. The results of the FAIR Test showed that 37 people (34.9%) did not experience piriformis syndrome, and 69 people (65.1%) experienced piriformis syndrome.

Table 2 shows it was found that of the 106 research subjects examined using the FAIR Test, the percentage who worked in a sitting position with a duration of <5 hours who did not complain of piriformis

Table 1. Characteristics of research subjects

Characteristics	Frequency (n)	Percentage (%)
Age		
45	13	12.3
46	17	16.0
47	9	8.5
48	7	6.6
49	9	8.5
50	11	10.4
51	4	3.8
52	2	1.9
53	7	6.6
54	12	11.3
55	15	14.2
Gender		
Male	35	33
Female	71	67
Sitting duration		
<5 Hour	45	42.5
≥5 Hour	61	57.5
Active Piriformis Test		
No	44	41.5
Yes	62	58.5
Pace Test		
No	27	25.5
Yes	79	74.5
FAIR Test		
No	37	34.9
Yes	69	65.1

Table 2. Distribution of piriformis syndrome based on sitting duration

Sitting Duration	FAIR Test				Total (%)	
	No		Yes			
	n	%	n	%	n	%
<5 Hour	23	62.2	22	31.9	45	42.45
≥5 Hour	14	37.8	47	68.1	61	57.55
Total	37	100	69	100	106	100

Table 3. Relationship between sitting duration and piriformis syndrome

Sitting Duration	FAIR Test				Total (%)		Asymptotic Significance (2- sided)
	No		Yes				
	n	%	n	%	n	%	
<5 Jam	23	62.2	22	31.9	45	42.45	
≥5 Jam	14	37.8	47	68.1	61	57.55	0.003
Total	37	100	69	100	106	100	

syndrome was 23 people (62.2%) while those who complained of piriformis syndrome were 22 people (31.9%). Research subjects who work in a sitting position with a duration of ≥5 hours who do not complain of piriformis syndrome are 14 people (37.8%), while those who complain of piriformis syndrome are 47 people (68.1%).

The *chi-square* test results listed in Table 3 show an Asymp. Sid (2-sided) value of 0.003. The basis for decision-making in this study is that if the p-value or Asymptotic significance (2-sided) obtained is less than the significance level (α) used, namely 5% (0.05), then Ho is rejected, and Ha is accepted. The *p*-value or Asymptotic significance (2-sided) obtained from the chi-square test in this study is 0.003, which means that the value is less than 0.05, so Ho is rejected. These results indicate a significant relationship between sitting duration and piriformis syndrome in 106 *serati banten* samples in Gianyar.

DISCUSSION

The productive age for working in Indonesia is 15-64. Handcrafters of *serati banten* are older people in the village who are still productively working. The serati banten in this study have worked for many years or a long time. This study's results align with previous studies on *serati banten*, which reported that a *serati banten* is 40-60 years old, with the majority aged 40-49 years old.[11] The most common age of piriformis syndrome patients occurs in the fourth and fifth decades of life, namely at 40-60, with various activities.[6,12]

In the fifth decade and above, physiological changes can delay healing of the piriformis muscle after traumatic and chronic injuries.[13,14] The older a person is, the slower the healing process or the process of repairing a tissue. There is also a tissue turnover into scar tissue and a reduction in fluid, which can lead to reduced stability in muscles and bones. The older the person, the higher the risk of experiencing a decrease in tissue elasticity in the body. This is a trigger for the onset of symptoms of musculoskeletal disorders.[14] These results were obtained because the *serati banten* profession is predominantly female. This study's results align with previous research, which reported that the *serati banten* profession is dominated by women.[10]

These results are in line with previous research, which states that a person who sits for a long duration, which ranges from an average of 5 hours or more (5-7 hours), causes complaints of piriformis syndrome compared to a person who sits for <5 hours (2-4 hours).[6,15,16] The results of this study are also in line with a survey conducted by Boyajian et al. in 2008, which states that one of the external factors for piriformis syndrome is sitting for 5 hours or more.[17] Another study conducted by Siahaan et al. in 2019 states that of 65 patients with piriformis syndrome, sitting for an average of 5 hours is the most significant risk factor for piriformis syndrome.[6]

This study's results align with previous studies conducted by Siahaan et al. in 2019, which state that of the 65 patients with piriformis syndrome, sitting for an average duration of 5 hours is the most significant risk factor for piriformis syndrome.[6] During 9 hours of work, *serati banten* in this study sat for an average of 5 hours. Prolonged sitting or prolonged sitting (microtrauma) is the highest risk factor for piriformis syndrome. Where it is stated that one of the causes of piriformis syndrome is repetitive minor injury (microtrauma) because the piriformis muscle becomes overactive during sitting for a long duration and is prone to repetitive motion injury or RMI, which occurs when the muscle works beyond its ability or is not given enough time for the recovery phase.[18]

When the piriformis muscle is overused in a constant or continuous time, muscle inflammation causes muscle tightness. In addition, the increase in internal-external rotation and prolonged hip adduction causes weakness of the gluteus muscle and results in excessive activation of muscle synergy in the piriformis muscle, which further causes muscle inflammation, which leads to muscle tightness, which causes muscle spasms.[19]

Spasm that occurs in the piriformis muscle can compress the sciatic nerve and then cause impaired blood flow or supply to the muscles and nerves, causing pain stimulation from the piriformis muscle area to radiate to the leg, namely the sciatic nerve branching area and tingling radiating from the buttocks to the lower leg and causing clinical symptoms in the form of thickness, numbness, pain in the muscles, and tingling in the sciatic nerve branching area. If the situation is left for years, it can cause piriformis syndrome.[20] Handcrafters of *serati banten* who sit for ≥5 hours experience more piriformis syndrome than *serati banten* who sit for <5 hours.[6,21] As the duration of sitting increases, so does the risk of developing piriformis syndrome and other musculoskeletal disorders.[15,16]

This study has several limitations. First, this quantitative, analytic observational study used a cross-sectional approach. It might restrict the ability to establish causality or infer temporal relationships between events, limiting the depth of understanding of the observed relationships. Second, the inclusion and exclusion criteria might result in a sample that does not fully represent the broader population, as individuals with specific medical conditions or histories, such as low back pain, microtrauma, or recent hip and pelvis fractures, were excluded, potentially limiting the generalizability of the findings.

CONCLUSION

A significant relationship exists between sitting duration and piriformis syndrome in handcrafters of *serati banten* in Gianyar Regency. For future studies, it would be beneficial to consider employing a longitudinal design to examine the relationships between variables over time, allowing for a better understanding of causality and temporal relationships. Additionally, broadening the inclusion criteria to encompass a more diverse range of individuals, including those with relevant medical conditions or histories, could enhance the generalizability of the findings to a wider population. This would provide a more comprehensive understanding of the phenomenon under investigation and its implications for broader contexts.

ETHICAL CLEARANCE

This study received approval from the Research Ethics Commission of

the College of Medicine, Universitas Udayana, under registration number 2360/UN14.2.2.VII.14/LT/2023. Informed agreement from the respondents to the survey was also provided, which approved the use of sampling.

CONFLICT OF INTEREST

The author certifies that there are no conflicts of interest.

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AUTHOR CONTRIBUTIONS

IAHFW develops study designs, gathers and processes data, and writes publications. AANTND and IMNW are responsible for data collection and manuscript revision.

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