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THE CORRELATION OF PRIMARY INSOMNIA WITH PAIN IN THE CERVICAL AND THORACOLUMBAR REGIONS IN UNDERGRADUATE MEDICAL STUDENTS OF THE FACULTY OF MEDICINE, UDAYANA UNIVERSITY, CLASS OF 2023

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ABSTRACT

Pain in the cervical and thoracolumbar regions is a common musculoskeletal system disorder experienced by most people. This issue is caused by a variety of factors, including primary insomnia. This sleep disorder is highly prevalent in Indonesia and can affect anyone, including students. The purpose of this research was to examine the correlation between primary insomnia and cervical and thoracolumbar pain in undergraduate students from Udayana University's Faculty of Medicine, Class of 2023.This is a descriptive analytical research conducted in a cross-sectional design. The research included 156 participants who met the inclusion and exclusion criteria. Samples were collected by filling a self-data questionnaire, the Insomnia Severity Index (ISI), and the Nordic Musculoskeletal Questionnaire (NMQ). The data will be processed and analyzed univariately and bivariately with Microsoft Excel 2016 and SPSS 25. This research was also approved by Udayana University's Faculty of Medicine Research Ethics Commission.In this research, r value = 0.245 and p-value = 0.002 were found in the analysis of the correlation between primary insomnia and upper neck pain, r value = 0.170 and p-value = 0.034 in the analysis of the correlation between insomnia and lower neck pain, r value = 0.285 and p-value = 0.000 in the analysis of the correlation between insomnia and back pain, and r value = 0.265 and p-value = 0.001 in the analysis of the correlation between primary insomnia and low back pain.According to these findings, there is a significant correlation between primary insomnia and cervical and thoracolumbar pain.

Keywords: Primary Insomnia., Cervical Region Pain., Thoracolumbar Region Pain., Medical Students

INTRODUCTION

In addition to facilitating mobility, the musculoskeletal system plays a critical function in protecting the body and its organs. Musculoskeletal disorders are now among the most prevalent issues in the medical field. A group of injuries or conditions that affect the musculoskeletal system, including the muscles, nerves, tendons, joints, cartilage, and spinal discs, are referred to as disorders of the musculoskeletal system itself.[1] Musculoskeletal pain, which can be a symptom of this illness, might interfere with everyday activities like employment and mobilization for example. According to data from the Global Burden of Disease Study 2019, disorders of the musculoskeletal system are responsible for 1 in 10 increases in disability-adjusted life years (DALYs) between 1990 and 2019 and are prevalent from adolescence to adulthood, with a 30.7% increase in DALYs during this time.[2]

Musculoskeletal system illnesses are among the most prevalent health issues that can affect multiple parts of the human body. According to an Iranian research, the lower back region had the highest frequency of musculoskeletal system problems (72.4%), followed by the neck or cervical region (55.2%).[3] According to another research conducted in Poland, 87.4% of students who participated reported having back discomfort, particularly in the area of their lumbar spine.[4] A research of students at SMA Negeri 4 Denpasar also revealed similar findings, with the Nordic Body Map questionnaire indicating that the most common problems were in the neck, shoulders, and back.[5]

Primary insomnia is one of the causes that are linked to complaints of pain or aches in the neck to lower back area. One of the most prevalent sleep disorders, primary insomnia is characterized by circumstances that make it difficult for a person to fall asleep or stay asleep, which can have an impact on the health and quality of sleep. Although the exact cause of primary insomnia is still unknown, a number of sources clarify that it is not brought on by medical illnesses, psychiatric disorders, environmental factors, or the use of certain drugs or substances. Primary insomnia affects not only the neck and lower back, but also the quality of sleep, energy and stamina, mood, and functional ability, as well as the level of stress and worry and feelings of loneliness.[6] Insomnia is typically not confined to a certain age group. With a prevalence of 29%, insomnia/restlessness sleep difficulties (IRSD) is the most common type of sleep issues among teenagers, according to a study.[7] At 67%, Indonesia has a rather high prevalence of insomnia.[8] The Covid-19 epidemic has also been linked to an

increase in insomnia, according to a number of other research. According to a research with 31,432 participants from Indonesia, young men between the ages of 15 and 34 had the highest prevalence of insomnia.[9] This contradicts the findings of an Italian research that found women experience insomnia at a higher rate than men.[10]

One group of people who are prone to sleeplessness is medical students. This can be brought on by stress experienced throughout school, which subsequently affects how hard it is to fall or stay asleep. Additional risk variables, including gender, caffeine consumption, and the use of electronic devices, can contribute to insomnia in general.[11] However, there are known to be unexplained and unrelated reasons to primary insomnia disorders, including medical illnesses, psychiatric disorders, and the use of specific drugs or substances. Both the primary form of insomnia and insomnia associated with other diseases can impact sleep duration and are linked to the activation of multiple bodily mediators that also influence the body's reaction to pain. The deactivation of opioid, orexinergic, melatonin, and dopamine signaling mediators is a consequence of insomnia. The immune system and inflammatory mediators will be triggered in the meanwhile, causing an exaggerated response to discomfort or pain and complaints to arise in many parts of the musculoskeletal system, from the neck to the lower back.[12] Researchers are interested in studying the correlation of primary insomnia with pain in the cervical and thoracolumbar regions in undergraduate medical students of the Faculty of Medicine, Udayana University, Class of 2023, based on the previously described background. This research aims to determine the correlation of primary insomnia with pain in the cervical and thoracolumbar regions in undergraduate medical students of the Faculty of Medicine, Udayana University, Class of 2023.

Primary Insomnia

Insomnia is a sleep disorder characterized by difficulty initiating and/or maintaining sleep.[13] Primary insomnia, as defined in the DSM-IV, is defined as a sleep disturbance that does not arise during another mental illness and is not brought on by the direct consumption of medications or other substances. However, in the DSM-5 there is a change in the name from what was previously primary insomnia to insomnia disorder.[14] The four categories of insomnia include absence of insomnia, subthreshold insomnia, moderate insomnia, and severe insomnia, according to the Insomnia Severity Index (ISI) questionnaire.[15]

Pain in the Cervical and Thoracolumbar Regions

Cervical pain or neck pain is defined as a disorder of the musculoskeletal system in the form of pain felt in the cervical spine area and varies, from slight discomfort to severe pain.[16] Thoracolumbar pain is another complaint of the musculoskeletal system characterized by pain, numbness, or stiffness in the thoracic and lumbar spine areas. This pain can be felt specifically in certain areas or spread to the entire back, buttocks, legs, abdomen, and other areas of the body. Pain in the cervical and thoracolumbar regions can be caused by several factors, such as body position, fractures, infections, body mass index, length of work, and insomnia.[12,17–20]

MATERIAL AND METHOD

This research is a descriptive analytical research using a cross-sectional study design. The sample collection technique in this research is by collecting primary data obtained from filling out questionnaires offline. The total sampling approach, which selects a sample from the entire population that satisfies the inclusion and exclusion criteria, was used to choose the sample. This research has obtained approval from the Research Ethics Commission of the Faculty of Medicine, Udayana University with the number Ethical Clearance/Ethical Eligibility Statement 0690/UN14.2.2.VII.14/LT/2024. The sample for this research involved 156 Udayana University students enrolled in the 2023 Undergraduate Medical Study Program who willing to become respondents by filling out an informed consent. Students who have a history or are diagnosed with musculoskeletal system disorders, such as fractures in the cervical region, fractures in the thoracolumbar region, osteoarthritis, spinal deformities (kyphosis, lordosis, scoliosis), and a history of surgery in the cervical region and/or thoracolumbar region; have serious medical conditions (cancer in the cervical and/or thoracolumbar regions); experiencing symptoms or having been diagnosed with non-insomnia sleep disorders; and experiencing insomnia symptoms that arise from taking medication, psychological disorders, or other medical conditions were excluded from this research. The research questionnaire was distributed offline and contained several questions included the respondent's personal data, the Insomnia Severity Index (ISI) questionnaire, and the Nordic Musculoskeletal Questionnaire (NMQ). The personal data questionnaire was used to obtain information about the respondent's name, age, gender, and medical history. The ISI questionnaire was used to identify the severity of insomnia experienced by the respondent. Based on the scores from all the questions, the severity of insomnia was separated into four categories: no clinically significant insomnia (score 0-7), subthreshold insomnia (score 8-14), clinical insomnia (moderate severity) (score 15-21), and clinical insomnia (severe) (score 22-28). Meanwhile, musculoskeletal complaints, more specifically in the cervical and thoracolumbar regions, were identified using the NMQ. The severity experienced by respondents was stated with a score of 0 (no pain), 1 (quite pain), 2 (pain), and 3 (very painful). The data collected through filling out the questionnaire were processed using Microsoft Excel 2016 and the Statistical Package for the Social Science (SPSS) version 25. Univariate analysis was conducted to explain the prevalence and characteristics of primary insomnia sufferers, as well as the prevalence of cervical and thoracolumbar pain. Meanwhile, bivariate analysis was conducted to determine the correlation between primary insomnia and cervical and thoracolumbar pain in undergraduate medical students of the Faculty of Medicine, Udayana University, class of 2023. Nonparametric analysis using the Spearman statistical test was conducted to test the hypothesis in this research. The results of the data analysis will be grouped according to their variables and presented in the form of graphs or tables.

RESULT

Data and Analysis of the Prevalence of Primary Insomnia

Descriptive analysis of the prevalence of primary insomnia in research participants is presented in Figure 1 and Table 1 below.

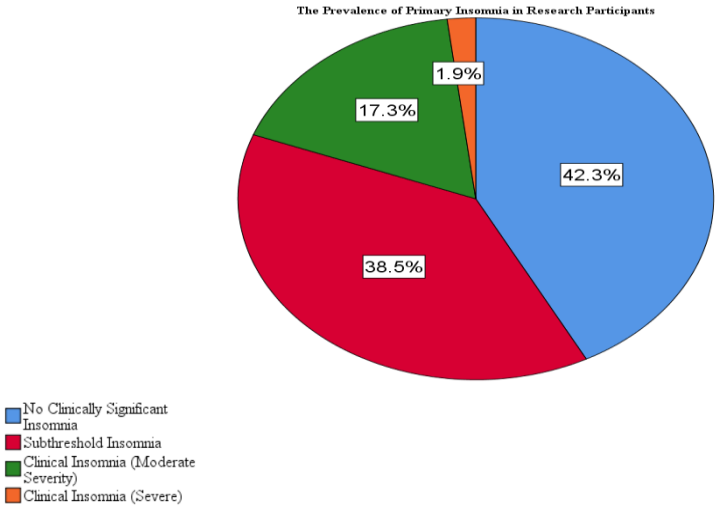

Figure 1. The prevalence of primary insomnia in research participants

Table 1. The prevalence of primary insomnia in research participants

Variable	n	%
No Clinically Significant Insomnia	66	42.3
Subthreshold Insomnia	60	38.5
Clinical Insomnia (Moderate Severity)	27	17.3
Clinical Insomnia (Severe)	3	1.9

Based on Figure 1 and Table 1, the prevalence of primary insomnia in research participants can be seen. Most research participants did not experience insomnia significantly (n = 66; 42.3%). Meanwhile, clinical insomnia (severe) is the type with the least number of sufferers (n = 3; 1.9%).

Data and Analysis of Characteristics of Primary Insomnia Sufferers in Research Participants

The characteristics of primary insomnia sufferers in this research include age, gender, and severity of primary insomnia in research participants. Descriptive analysis of the characteristics of primary insomnia sufferers in research participants is presented in Table 2.

Table 2. Description of age, gender, and severity of primary insomnia in study participants

Variable	Primary Insomnia							
	No clinically significant		Subthreshold		Clinical (moderate severity)		Clinical (severe)	
	n	%	n	%	n	%	n	%
Age								
< 19 years	31	47	23	38.3	13	48.1	2	66.7
≥ 19 years	35	53	37	61.7	14	51.9	1	33.3
Gender								
Male	26	39.4	14	23.3	9	33.3	1	33.3
Female	40	60.6	46	76.7	18	66.7	2	66.7

Based on table 2, it can be seen that the type of insomnia most commonly experienced by research participants is subthreshold insomnia. Of the 60 research participants who experienced subthreshold insomnia, 37 people (61.7%) were in the age group ≥ 19 years and 46 people (76.7%) were female.

Data and Analysis of the Prevalence of Cervical and Thoracolumbar Pain

Based on this research, it was stated that there were complaints of cervical region pain felt by a number of research participants, with the most complaints in the upper neck area with a quite pain level of complaints (n = 39; 25%) as described in

Table 3. In addition, complaints of thoracolumbar pain were also felt by a number of research participants, with the most complaints in the low back area with a quite pain level of complaints (n = 46; 29.5%).

Table 3. The prevalence of cervical and thoracolumbar pain

Type of complaints	No pain		Quite pain		Pain		Very painful	
	n	%	n	%	n	%	n	%
Upper neck	99	63.5	39	25	18	11.5	-	-
Lower neck	109	69.9	30	19.2	17	10.9	-	-
Left shoulder	111	71.2	33	21.2	11	7.1	1	0.6
Right shoulder	103	66	42	26.9	11	7.1	-	-
Left upper arm	148	94.9	5	3.2	3	1.9	-	-
Back	80	51.3	45	28.8	25	16	6	3.8
Right upper arm	143	91.7	4	2.6	9	5.8	-	-
Low back	93	59.6	46	29.5	12	7.7	5	3.2
Upper buttocks	134	85.9	18	11.5	3	1.9	1	0.6
Lower buttocks	141	90.4	11	7.1	4	2.6	-	-
Left elbow	147	94.2	8	5.1	1	0.6	-	-
Right elbow	146	93.6	8	5.1	2	1.3	-	-
Left lower arm	145	92.9	11	7.1	-	-	-	-
Right lower arm	145	92.9	9	5.8	2	1.3	-	-
Left wrist	141	90.4	9	5.8	6	3.8	-	-
Right wrist	134	85.9	15	9.6	6	3.8	1	0.6
Left hand	139	89.1	13	8.3	4	2.6	-	-
Right hand	137	87.8	16	10.3	3	1.9	-	-
Left thigh	139	89.1	14	9	3	1.9	-	-
Right thigh	141	90.4	13	8.3	2	1.3	-	-
Left knee	140	89.7	14	9	2	1.3	-	-
Right knee	143	91.7	9	5.8	4	2.6	-	-
Left calf	129	82.7	21	13.5	6	3.8	-	-
Right calf	129	82.7	21	13.5	6	3.8	-	-
Left ankle	138	88.5	15	9.6	3	1.9	-	-
Right ankle	138	88.5	16	10.3	2	1.3	-	-
Left foot	142	91	9	5.8	5	3.2	-	-
Right foot	142	91	9	58	5	32	-	-

Data and Analysis of the Correlation between Primary Insomnia and Cervical Pain

The analysis of the correlation between primary insomnia and upper neck pain is presented in Table 4. In the data analysis, the r value = 0.245 and p-value = 0.002 were found, indicating that there is a weak positive correlation between primary insomnia and upper neck pain which is proven significantly. This shows that the more severe the level of primary insomnia, the level of pain in the upper neck experienced also tends to increase.

Table 4. The correlation between primary insomnia and cervical region pain (upper neck)

		Primary insomnia	Cervical region pain (upper neck)
Primary insomnia	Correlation coefficient	1.000	0.245**
	Sig. (2-tailed)		0.002
	N	156	156
Cervical region pain (upper neck)	Correlation coefficient	0.245**	1.000
	Sig. (2-tailed)	0.002	
	N	156	156

**. The correlation is significant at the 0.01 level of significance (2-tailed).

The analysis of the correlation between primary insomnia and lower neck pain is presented in Table 5. In the data analysis, the r value = 0.170 and p-value = 0.034 were found, indicating that there is a weak positive correlation between primary insomnia and lower neck pain which is proven significantly. This

shows that the more severe the level of primary insomnia, the level of pain in the lower neck experienced also tends to increase.

Table 5. The correlation between primary insomnia and cervical region pain (lower neck)

		Primary insomnia	Cervical region pain (lower neck)
Primary insomnia	Correlation coefficient	1.000	0.170*
	Sig. (2-tailed)		0.034
	N	156	156
Cervical region pain (lower neck)	Correlation coefficient	0.170*	1.000
	Sig. (2-tailed)	0.034	
	N	156	156

*. The correlation is significant at the 0.05 level of significance (2-tailed).

Data and Analysis of the Correlation between Primary Insomnia and Thoracolumbar Pain

The analysis of the correlation between primary insomnia and back pain is presented in Table 6. In the data analysis, r = 0.285 and p-value = 0.000 were found, indicating that there is a weak positive correlation between primary insomnia and back pain which is proven to be very significant. This shows that the more severe the level of primary insomnia, the level of back pain experienced also tends to increase.

Table 6. The correlation between primary insomnia and thoracolumbar region pain (back)

		Primary insomnia	Thoracolumbar region pain (back)
Primary insomnia	Correlation coefficient	1.000	0.285**
	Sig. (2-tailed)		0.000
	N	156	156
Thoracolumbar region pain (back)	Correlation coefficient	0.285**	1.000
	Sig. (2-tailed)	0.000	
	N	156	156

*. The correlation is significant at the 0.01 level of significance (2-tailed).

The analysis of the correlation between primary insomnia and low back pain is presented in Table 7. In the data analysis, the r value = 0.265 and p-value = 0.001 were found, indicating that there is a weak positive correlation between primary insomnia and low back pain which is proven to be very significant. This shows that the more severe the level of primary insomnia, the level of low back pain experienced also tends to increase.

Table 7. The correlation between primary insomnia and thoracolumbar region pain (low back)

		Primary insomnia	Thoracolumbar region pain (low back)
Primary insomnia	Correlation coefficient	1.000	0.265**
	Sig. (2-tailed)		0.001
	N	156	156
Thoracolumbar region pain (low back)	Correlation coefficient	0.265**	1.000
	Sig. (2-tailed)	0.001	
	N	156	156

*. The correlation is significant at the 0.01 level of significance (2-tailed).

DISCUSSION

The Prevalence of Primary Insomnia

The results of this research indicate that most of the research participants who were students of the Undergraduate Medical Study Program, Class of 2023 did not experience significant primary insomnia, with a total of 66 people (43.3%). This can be caused by several factors, including good mediator regulation in the body, the implementation of sleep hygiene, and good stress management. The findings of this research differ from the results of previous research conducted on students of the Faculty of

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Medicine, Udayana University in 2017, which stated that most participants experienced clinical insomnia (moderate severity) with a total of 28 people (56%).[21] This difference is due to the diverse characteristics of the respondents accompanied by other factors that cause insomnia, such as sleep habits, residential status, and sleeping environment conditions.

The Characteristics of Primary Insomnia Sufferers in Research Participants

Based on this research, it was found that most of the research participants who experienced primary insomnia were in the age group ≥ 19 years, female, and experienced primary insomnia with a subthreshold insomnia severity level. Previous research involving students of the Faculty of Medicine, Universitas Muhammadiyah Semarang with the largest age group in the range of 18-19 years stated that the majority of participants experienced mild insomnia, in line with the results of this research.[22] This is due to several factors related to biological changes with age. One finding states that in older people, circadian rhythm variations become greater during wakefulness than during sleep. Circadian rhythm variations can be influenced by several things, such as lifestyle, sleep habits, and changes in time zones. Changes in circadian rhythm variations can affect an individual's biological clock, so that they can also have an impact on the occurrence of insomnia.[23]

Other research also present similar results related to the gender that dominates students with insomnia, namely women with a total of 76 out of 94 total respondents.[24] This can be caused by the presence of female reproductive hormones, estrogen and progesterone, which also affect sleep regulation. A research states that a decrease in female reproductive hormones can be associated with a decrease in melatonin synthesis, so that sleep regulation will be disrupted.[25]A research conducted in 2022 at Warmadewa University stated that in students who experience insomnia, most are at the subthreshold insomnia severity level.[26] The results of this research support the findings of this research. However, different findings were stated by Sathivel and Setyawati, namely that 56% of respondents experienced clinical insomnia (moderate severity).[21] The diverse characteristics and dissimilar research populations and samples allow for differences in the results of these researches.

The Prevalence of Cervical and Thoracolumbar Pain

Based on this research, the most complaints of cervical pain were felt in the upper neck area with a quite pain level of complaints, followed by complaints of lower neck pain with a quite pain level of complaints. This is in line with a research conducted on undergraduate medical students in Central India which stated a high prevalence of neck pain, with the results that 57.3% of respondents experienced pain in that area.[27] Another research conducted on Udayana University Dental Students in 2019 also showed quite high results for the prevalence of lower neck pain, which was 47.6% of the total respondents.[28] These complaints can be experienced by individuals due to increased pressure on the cervical region, workload, and changes in several inflammatory mediators in the body caused by insomnia.[12,17,20]Meanwhile, the most frequent complaints of thoracolumbar pain were felt in the low back area with a quite pain level of complaints, followed by complaints of back pain with a quite pain level of complaints. These results are in line with previous research on medical students at King Faisal University which stated a high prevalence of back pain, namely 254 out of 300 participants experienced back pain, especially the lower back.[29] In addition, another research conducted on students of the Faculty of Medicine, Udayana University is also in line with this research, stating that 105 out of 302 respondents experienced back pain.[30] The emergence of complaints of pain in the thoracolumbar region is caused by several factors, such as fractures, increased pressure on the thoracolumbar region, infection, or activation of inflammatory mediators as a result of insomnia.[12,18]

The Correlation between Primary Insomnia and Cervical Pain

The results of this research indicate that there is a weak positive correlation between primary insomnia and cervical pain which is proven significantly. This can also be interpreted as the more severe the level of primary insomnia, the level of pain in the cervical region experienced also tends to increase. This finding is in line with the results of previous research which stated that poor sleep quality is associated with the occurrence of cervical pain in adolescents.[31] This is also supported by the theory regarding the mechanism of activation of inflammatory mediators in the immune system and non-activation of mediators with analgesic properties caused by insomnia, so that there will be a pain stimulus which is then processed and delivered to the location of pain in the body area.[12,32–34] Neuroanatomical aspects also play a role in the occurrence of this mechanism. Primary insomnia experienced by participants can cause dysfunction in the central nervous system, especially the hypothalamus. This is due to changes in several neurotransmitters, such as dopamine and adenosine as a result of primary insomnia. In the hypothalamus, there are suprachiasmatic nuclei that play a role in regulating circadian rhythms. If there is dysfunction in the hypothalamus, it will result in disruption of the circadian rhythm. This condition will cause an increase in pro-inflammatory cytokines, such as IL-1β and TNF-α, which stimulate the production of more prostaglandin hormones so that pain stimuli will appear in the body region, including the cervical region.[35]

The Correlation between Primary Insomnia and Thoracolumbar Pain

The results of this research indicate that there is a weak positive correlation between primary insomnia and thoracolumbar pain which is proven to be very significant. This can also be interpreted as the more severe the level of primary insomnia, the level of pain in the thoracolumbar region also tends to increase. These results are in line with previous findings that describe poor sleep quality and its association with lumbar pain.[31] These results are also supported by a theory similar to the previous one, namely regarding the mechanism of activation and non-activation of mediators in the body caused by insomnia, resulting in the emergence of pain stimuli that will be processed and transmitted to certain areas of the body.[12,32–34] This mechanism also involves neuroanatomical aspects, related to dysfunction in the hypothalamus. This will cause the circadian rhythm to be disturbed and there will be an increase in pro-inflammatory cytokines, such as IL-1β and TNF-α, which will stimulate the production of prostaglandin hormones so that pain stimuli will

arise in the body region, one of which is the thoracolumbar region.[35]

CONCLUSIONS AND SUGGESTIONS

Based on the results of the data analysis and discussion that have been presented previously, it can be concluded that most of the participants who are undergraduate students of the Faculty of Medicine, Udayana University, class of 2023 do not experience significant primary insomnia. The research participants who suffer from insomnia are mostly in the age group ≥ 19 years, female, and experience primary insomnia with a subthreshold insomnia severity level. In this research, a fairly high number of research participants who experienced cervical region pain was also found. The most complaints were experienced by 25% of the total participants in the upper neck area with a quite pain level of complaints. Complaints of thoracolumbar region pain experienced by research participants were also stated to be quite high. As many as 29.5% of the total participants complained of pain in the low back area with a quite pain level of complaints.

This research also analyzed the correlation between variables. Based on the findings of this research, it can be concluded that there is a correlation between primary insomnia and cervical and thoracolumbar region pain which was stated to be significantly proven. The more severe the primary insomnia experienced, the more it will be accompanied by increased pain in the cervical and thoracolumbar regions.

Based on the previous explanation, researchers realizes that there are still many weaknesses and limitations in this research. Therefore, there are several suggestions that can be made, such as:

1. Similar research can be conducted in the future with a more diverse population, research location, research design, and measuring instruments, so that the samples and data obtained are more representative and comprehensive.
2. It is hoped that further research can analyze other factors related to primary insomnia, cervical pain, and thoracolumbar pain. The use of other methods can also be done to determine the correlation between primary insomnia and more diverse cervical and thoracolumbar pain.
3. Respondents are expected to maintain a good lifestyle and sleep patterns to minimize the occurrence of primary insomnia, cervical pain, and thoracolumbar pain.

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