Prevalence and treatment of chronic musculoskeletal pain focused on service gaps: a comparative analysis by age group and body part

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ABSTRACT

Background: Occupational health, grounded in occupational medicine, aims to enhance the well-being and labor productivity of the working population. Within this realm, there has been growing concern over the increasing instances of labor loss due to diminished physical capacity and the rise in musculoskeletal disorders. Chronic pain is also associated with musculoskeletal disorders. Another pressing issue related to chronic musculoskeletal pain was needed assistance services are underutilized, is referred to as a "service gap". Understanding trends based on age and affected regions of the body is indispensable for developing strategies to address chronic musculoskeletal pain in workers. This study aimed to elucidate age-specific trends in the prevalence and number of pain sites in chronic musculoskeletal pain as well as the patterns of treatment during chronic musculoskeletal pain, categorized by age and affected site.

Methods: This study was conducted in December 2022 in contract to Cross Marketing Inc. The survey began on December 12, 2022 and ended on December 15, 2022. An online survey was administered to 1,946 participants (973 women and 973 men), and responses were collected, ensuring a roughly equal distribution of samples among men and women across six age groups ranging from their 20 to 70 s. The survey inquired about the presence of chronic pain in each of the eight body parts and the adoption of five different treatments when experiencing pain. Statistical analysis was performed using the chi-square test, with the measurement data categorized by age group and body part.

Results: The results indicated a significantly higher prevalence of chronic pain at three or more sites among individuals in their 30 s: the prevalence of pain at each of the eight body sites varied with age. Approximately half of the participants did not engage in specific treatments during episodes of chronic pain. The presence or absence of treatment showed no significant differences according to affected site or age group. This study revealed age- and body part-related relationships with chronic

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musculoskeletal pain in middle-aged patients and highlighted healthcare service gaps in its management in Japan.

Subjects Anesthesiology and Pain Management, Health Policy, Mental Health, Rehabilitation
Keywords Chronic pain, Musculoskeletal pain, Age groups

INTRODUCTION

Occupational health, grounded in occupational medicine, aims to enhance the well-being and labor productivity of the working population. Within this realm, there has been growing concern over the increasing instances of labor loss due to diminished physical capacity and the rise in chronic diseases (*Takano, 2015*). Labor losses can be categorized into absenteeism and presenteeism. While absenteeism generally pertains to sickness absences or medical leave, presenteeism refers to the reduced performance of employees attending work despite health issues (*Yamashita & Arakida, 2006*). The productivity loss from presenteeism has been reported to be approximately three times the cost of absenteeism (*Nagata et al., 2018*). Furthermore, presenteeism has been identified as a subsequent risk factor for absenteeism (*Janssens et al., 2013*; *Taloyan et al., 2012*), emphasizing the necessity to address the underlying health issues causing presenteeism so as to enhance organizational productivity. When examining the loss per individual due to presenteeism among Japanese workers based on specific symptoms, the most common health complaints (arranged in descending order) were mental disorders, neck pain/shoulder stiffness, and lower back pain (*Yoshimoto et al., 2020*). These findings suggest that psychological factors and musculoskeletal disorders significantly influence presenteeism in the Japanese workplace. Therefore, implementation of preventive measures and interventions to address the mental and physical health of the workers is of paramount importance.

Chronic pain is also associated with musculoskeletal disorders. As defined by the International Association for the Study of Pain, chronic pain is described as "pain that persists beyond the normal time frame expected for healing, or pain based on progressive non-malignant pain." Typically, pain lasting for more than 3 months is classified as chronic. In the revised International Classification of Diseases (ICD-11) from 2018, chronic pain is divided into two primary categories: chronic primary pain and chronic secondary pain (*Treede et al., 2019*). Among these categories, chronic musculoskeletal pain, whether primary or secondary, can influence the previously mentioned presenteeism. By addressing prevention and improvement measures for both types of chronic musculoskeletal pain, enhanced labor productivity can be anticipated.

Understanding trends based on age and affected regions of the body is indispensable for developing strategies to address chronic musculoskeletal pain in workers. Previous epidemiological studies in Japan have indicated a higher prevalence of chronic pain in the elderly (*Hattori, 2006*). However, when focusing solely on the musculoskeletal system, research has shown a higher incidence among individuals in their 30 to 50 s, who are commonly referred to as middle-aged adults (*Nakamura et al., 2011*). While these studies

offer age-based comparisons, they target individuals who experience chronic pain in "any region of the body"; to our knowledge, no study has specifically elucidated the trends for distinct body regions by age. Moreover, considering the severity and physical burden of pain, elucidating the number of pain sites according to age could provide critical insights for future research and pain management strategies. However, no research currently exists that offers a comparison of the number of pain sites by age.

Another pressing issue related to chronic musculoskeletal pain was made evident in the 2022 Comprehensive Survey of Living Conditions. Symptoms, such as lower back pain, shoulder stiffness, and joint pain, consistently rank high in prevalence. Comparing these data with results from a decade ago, there was no notable change in the reported prevalence rate or symptoms, indicating that the percentage of individuals experiencing pain had not decreased (*Japan Hawsi, 2022*). One potential reason for this stagnant situation is the general tendency to downplay chronic musculoskeletal pain as it does not pose a direct threat to life, leading to inadequate treatment. This phenomenon, where needed assistance services are underutilized, is referred to as a "service gap" (*Kushner & Sher, 1991*). In psychology, it is reported that only about 20% of individuals with conditions such as depression or eating disorders seek medical interventions (*Cachelin & Striegel-Moore, 2006*). A 2019 survey showed that only 3% utilized psychological counseling, with only 6% expressing a proactive intention to do so (*Innovation of SMEaR, 2019*). Therefore, we hypothesized that there may be a similar service gap in the treatment of chronic musculoskeletal pain. Existing studies have primarily discussed treatment for chronic pain with moderate to severe intensity (VAS 5 or higher). However, considering the service gap where even mild pain persists for more than three months without improvement, it is essential to include investigations that also consider mild pain. It is also imperative to investigate whether the service gap manifests differently across age groups.

The primary objectives of this study were to elucidate age-related trends in the prevalence of chronic musculoskeletal pain by body region and number of pain sites, as well as to uncover the age- and region-specific tendencies in treatment when experiencing chronic musculoskeletal pain.

SURVEY METHODOLOGY

Study design and participants

A cross-sectional, self-administered, anonymous, internet-panel survey was conducted. Survey participants were residents of Japan, aged 20 years old and over 79 years old, capable of answering the questionnaire in Japanese. This study was conducted in December 2022 in contracted to Cross Marketing Inc. The survey began on December 12, 2022 and ended on December 15, 2022. An online survey was administered to 1,946 participants (973 women and 973 men), and responses were collected, ensuring a roughly equal distribution of samples among men and women across six age groups ranging from their 20 to 70 s. The sample size was determined based on a predicted response rate of approximately 20%, derived from prior studies (*Nakamura et al., 2011*). Considering budget constraints, the need to compare across different age groups, and to discuss coping strategies among those with chronic pain, a target of 300 participants per age group was

set. To address potential biases predicted from previous research, such as significant gender differences, an equal number of males and females was ensured within each age group. Furthermore, to counter potential biases due to differences in occupation, residence, and educational background, participants were randomly assigned. This study was performed in accordance with the guidelines of the Declaration of Helsinki and was approved by the Ethics Committee of the Kanazawa Orthopedic Sports Medicine Clinic (Kanazawa-OSMC-2022-007). The participant recruitment process for this study began with Cross Marketing Inc. soliciting individuals who met the eligibility criteria for the survey panel. A subset of these solicited individuals accessed the study's website to review the informed consent form. Following this review, the participants formally agreed to partake in the study by clicking the button labeled "I have read the informed consent form and agree to participate in this study of my own free will" on the informed consent page.

Questionnaire

The questionnaire was developed based on prior studies of chronic pain in Japan (*Hattori, 2006*; *Matsudaira, 2011*; *Nakamura et al., 2011*). Initially, the respondents were asked to provide basic information, including their sex and age. The first question pertained to chronic pain experienced in any of the eight body parts (neck, shoulder, elbow, wrist/hand, lower back, hip joint, knee, and ankle/foot) in the past year, appearing at least twice a week, and lasting for more than 3 months. The presence or absence of pain was assessed dichotomously. Illustrative diagrams were presented to help the participants easily identify these body parts. We specified that the degree and intensity of pain included mild discomfort such as feelings of fatigue and heaviness. It was explicitly stated in the questionnaire that the chronic pain in question did not include acute pain such as fractures, bruises, or pain associated with cancer.

Subsequently, the second question was structured such that only those who answered positively to experiencing pain in the previous question were allowed to respond. This question probed the actions taken to address pain. Participants were asked, using a dichotomous method for each, whether they had sought any of the following five treatments: visiting a hospital, undergoing rehabilitation, receiving treatment from acupuncture/massage/osteopathy clinics, having a massage, or self-management. The development of these five coping behavior strategies was based on previous research and the Japanese Guidelines for Chronic Pain (*Malfliet et al., 2019*; *Sterling et al., 2019*). In this study, as the discussion focuses primarily on rehabilitation, the use of painkillers and the use of surgery/injections, which are critical components, were included under the category of hospital visits.

Statistical analysis

For the presence of chronic pain, respondents were categorized into four groups based on the number of affected body parts: "No pain," "Pain in one part," "Pain in two parts," and "Pain in three or more parts." The proportion of respondents in each group was calculated, and comparisons between age groups were performed using the chi-square test. This

process was repeated to determine the proportion of respondents with pain in specific body parts, again comparing age groups using the chi-squared test.

Regarding pain management interventions, those who chose any intervention other than self-management were categorized as "treatment action," while the rest were labeled as "No treatment action." The proportion of respondents who took "treatment action" was calculated and comparisons between different body parts and age groups were made using the chi-square test. This process was further refined to determine the proportion of respondents who undertook specific pain management interventions by comparing age groups for each body part using the chi-square test.

Additionally, among the study participants who visited a hospital, the proportion who underwent rehabilitation (hereafter referred to as the "hospital visit rehabilitation rate") was calculated, and comparisons between body parts were made using the chi-square test. For statistical analyses, SPSS Statistics software (version 28.0; IBM, Tokyo, Japan) was utilized, and the significance level was set at less than 5%.

RESULTS

In the current study, of the 1,946 participants, 627 (32.2%) reported experiencing chronic pain in at least one body part within the past year. Of the 973 male participants, 276 (28.4%) reported chronic pain, whereas among the 973 female participants, 361 (36.1%) reported the same, demonstrating a higher prevalence in women ($\chi2 = 13.260$, $p < 0.001$).

Table 1 shows the number of participants by age group who had chronic pain in one or more areas, including those in their 20 s (27.4%), 30 s (33.5%), 40 s (33.7%), 50 s (33.7%), 60 s (33.7%), and 70 s (34.3%). The results of the chi-square test showed no significant differences ($\chi2 = 4.558$, $p = 0.472$). Next, we compared the age groups with chronic pain at one, two, and three or more sites using the chi-square test. The results were significant for one site and three or more sites ($\chi2 = 28.359$, $p = 0.019$), and the residuals were significantly higher for those in their 70 s for one site, significantly higher for those in their 30 s for three or more sites, and significantly lower for those in their 70 s.

Table 2 presents the proportion of individuals with chronic pain by body site, categorized by age group. An initial comparison among the age groups for each body site using a chi-square test and residual analysis revealed that the neck, shoulder, and lower back showed significantly higher values from the 20 to 60 s age groups than at other sites. In the 70 s age group, the shoulder and lower back pain scores were significantly higher. Further comparison by body site among the age groups showed significant results for the neck ($\chi2 = 12.677$, $p = 0.027$), hands/wrists ($\chi2 = 11.897$, $p = 0.036$), and knees ($\chi2 = 16.845$, $p = 0.005$). The 70 s age group reported a significantly lower value (8.6%) for the neck, the 30 s age group reported a significantly higher value (9.5%) for the hands/wrists, the 20 s age group reported a significantly lower value (4.9%) for the knees, and the 60 s age group reported a significantly higher value (12.0%) for the knees.

Table 3 presents the proportion of individuals who underwent treatment for chronic pain, categorized by body site and age. The proportion of individuals who engaged in treatment was lowest for the wrists (47.4%) and highest for the lower back (60.8%). Comparisons between body sites and age groups revealed no significant differences.

Table 1 Comparison of the number of chronic pain sites by age group. The numbers indicate the number of patients with chronic pain. Values in parentheses represent the proportion of prevalence of chronic pain. While the similar letters indicate no significant differences. Higher values in the order a < b < c.

	20–29			30–39			40–49			50–59			60–69			70–79		
	n = 325			*n* = 325			*n* = 324			*n* = 324			*n* = 324			*n* = 324		
	n	%		*n*	%		*n*	%		*n*	%		*n*	%		*n*	%	
0	236	(72.6)		216	(66.5)		218	(67.3)		218	(67.3)		218	(67.3)		213	(65.7)	
1	35	(10.8)	a	36	(11.1)	a	39	(12.0)	a	40	(12.3)	a	37	(11.4)	a	61	(18.8)	b
2	26	(8.0)		25	(7.7)		23	(7.1)		27	(8.3)		29	(9.0)		29	(9.0)	
3+	28	(8.6)	b	48	(14.8)	c	44	(13.6)	b	39	(12.0)	b	40	(12.3)	b	21	(6.5)	a

Table 2 Comparison of chronic pain by site and age group. The numbers indicate the number of patients with chronic pain. Values in parentheses represent prevalence of chronic pain. Similar letters indicate no significant differences, while higher values are in the following order: a < b < c. * < 0.05, ** < 0.01.

	20–29			30–39			40–49			50–59			60–69			70–79					
	n = 325			*n* = 325			*n* = 324			*n* = 324			*n* = 324			*n* = 324					
	n	%		*n*	%		*n*	%		*n*	%		*n*	%		*n*	%		$\chi 2$	*p*	
Neck	42	(12.9)	b	56	(17.2)	b	51	(15.7)	b	51	(15.7)	b	43	(13.3)	b	28	(8.6)	a	12.67	0.027	*
Shoulder	47	(14.5)		64	(19.7)		55	(17.0)		55	(17.0)		60	(18.5)		37	(11.4)		10.97	0.061	
Elbow	11	(3.4)		9	(2.8)		15	(4.6)		11	(3.4)		9	(2.8)		6	(1.9)		4.56	0.472	
Wrist/Hand	14	(4.3)	a	31	(9.5)	b	18	(5.6)	a	23	(7.1)	a	15	(4.6)	a	15	(4.6)	a	11.90	0.036	*
Lower back	52	(16.0)		70	(21.5)		68	(21.0)		61	(18.8)		55	(17.0)		51	(15.7)		6.84	0.233	
Hip joint	15	(4.6)		10	(3.1)		12	(3.7)		16	(4.9)		19	(5.9)		15	(4.6)		3.60	0.609	
Knee	16	(4.9)	a	21	(6.5)	b	18	(5.6)	b	27	(8.3)	b	39	(12.0)	c	32	(9.9)	b	16.85	0.005	**
Ankle/Foot	13	(4.0)		15	(4.6)		14	(4.3)		14	(4.3)		18	(5.6)		19	(5.9)		2.02	0.847	

Table 4 displays the proportion of treatment by age group for those body sites (neck, shoulder, lower back, and knee) that had higher rates of chronic pain.

Regarding hospital consultations, a comparison of age groups by body part revealed significant differences for the neck, shoulder, and lower back (Neck: $\chi 2 = 12.635$, $p = 0.027$; Shoulder: $\chi 2 = 16.991$, $p = 0.005$; Lower Back: $\chi 2 = 35.832$, $p < 0.001$). Examination of the residuals revealed that individuals in their 70 s (32.1%) had a significantly higher rate of consultations for neck pain. Individuals in their 30 s (17.2%) had significantly lower rates of shoulder pain, whereas those in their 70 s (27.0%) had significantly higher rates for it. Individuals in their 20 s (28.8%) and 30 s (17.1%) had significantly lower rates of lower back pain, whereas those in their 60 s (45.5%) and 70 s (45.1%) had significantly higher rates for it. Notably, the hospital consultation rates for individuals in their 30 s were below 30% in all cases.

No significant differences were observed between the body parts and age groups for rehabilitation. Similarly, no significant disparities were noted across the different body

Table 3 Comparison of treatment groups by body site and age. The numbers indicate the number of patients who underwent treatment. Values in parentheses represent the prevalence of treatment.

	Total	20–29	30–39	40–49	50–59	60–69	70–79		
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)	χ^2	*p*
Neck	146/271	24/42	35/56	23/51	25/51	23/43	16/28	4.06	0.541
	(53.9)	(57.1)	(62.5)	(45.1)	(49.0)	(53.5)	(57.1)		
Shoulder	172/318	24/47	39/64	27/55	28/55	34/60	20/37	2.33	0.802
	(54.1)	(51.1)	(60.9)	(49.1)	(50.9)	(56.7)	(54.1)		
Elbow	35/61	7/11	5/9	9/15	4/11	8/9	2/6	7.92	0.161
	(57.4)	(63.6)	(55.6)	(60.0)	(36.4)	(88.9)	(33.3)		
Wrist/Hand	55/116	6/14	16/31	8/18	10/23	7/15	8/15	0.76	0.980
	(47.4)	(42.9)	(51.6)	(44.4)	(43.5)	(46.7)	(53.3)		
Lower back	217/357	27/52	43/70	35/68	41/61	37/55	34/51	6.94	0.225
	(60.8)	(51.9)	(61.4)	(51.5)	(67.2)	(67.3)	(66.7)		
Hip joint	42/87	7/15	4/10	6/12	9/16	9/19	7/15	0.74	0.981
	(48.3)	(46.7)	(40.0)	(50.0)	(56.3)	(47.4)	(46.7)		
Knee	76/153	9/16	8/21	7/18	17/27	17/39	18/32	5.32	0.378
	(49.7)	(56.3)	(38.1)	(38.9)	(63.0)	(43.6)	(56.3)		
Ankle/Foot	47/93	7/13	7/15	7/14	3/14	11/18	12/19	7.22	0.205
	(50.5)	(53.8)	(46.7)	(50.0)	(21.4)	(61.1)	(63.2)		

Table 4 Treatment for chronic pain by age group for neck, shoulder, lower back, and knee. The numbers indicate the number of patients who underwent treatment. Values in parentheses represent the prevalence of treatment. Similar letters indicate no significant differences, while higher values are in the following order: a < b < c. * < 0.05, ** < 0.01.

	20–29		30–39		40–49		50–9		60–69		70–79				
	n (%)		*n* (%)		*n* (%)		*n* (%)		*n* (%)		*n* (%)		χ^2	*p*	
Hospital															
Neck	12/42 (28.5)	a	12/56 (21.4)	a	8/51 (15.6)	a	14/51 (27.4)	a	9/43 (20.9)	a	9/28 (32.1)	b	12.69	0.026	*
Shoulder	8/47 (17.0)	b	11/64 (17.1)	a	11/55 (20.0)	b	13/55 (23.6)	b	18/60 (30.0)	b	10/37 (27.0)	c	17.53	0.004	*
Lower back	15/52 (28.8)	a	12/70 (17.1)	a	20/68 (29.4)	b	23/61 (37.7)	b	25/55 (45.4)	c	23/51 (45.0)	c	36.59	<0.001	*
Knee	7/16 (43.7)		4/21 (19.0)		4/18 (22.2)		10/27 (37.0)		11/39 (28.2)		16/32 (50.0)		10.83	0.055	
Rehabilitation															
Neck	5/42 (11.9)		4/56 (7.1)		4/51 (7.8)		7/51 (13.7)		5/43 (11.6)		4/28 (14.2)		8.04	0.154	
Shoulder	6/47 (12.7)		5/64 (7.8)		7/55 (12.7)		8/55 (14.5)		9/60 (15.0)		3/37 (8.1)		9.90	0.078	

(Continued)

Table 4 (continued)

	20–29		30–39		40–49		50–9		60–69		70–79				
	n (%)		*n* (%)		*n* (%)		*n* (%)		*n* (%)		*n* (%)		χ^2	*p*	
Lower back	5/52 (9.6)		8/70 (11.4)		5/68 (7.3)		14/61 (22.9)		11/55 (20.0)		10/51 (19.6)		10.23	0.069	
Knee	1/16 (6.2)		1/21 (4.7)		1/18 (5.5)		5/27 (18.5)		8/39 (20.5)		9/32 (28.1)		10.50	0.062	
Osteopathy clinics															
Neck	7/42 (16.6)		17/56 (30.3)		13/51 (25.4)		10/51 (19.6)		8/43 (18.6)		10/28 (35.7)		6.31	0.277	
Shoulder	10/47 (21.2)		19/64 (29.6)		12/55 (21.8)		14/55 (25.4)		11/60 (18.3)		12/37 (32.4)		7.22	0.205	
Lower back	7/52 (13.4)		21/70 (30.0)		15/68 (22.0)		15/61 (24.5)		13/55 (23.6)		16/51 (31.3)		2.91	0.714	
Knee	2/16 (12.5)		2/21 (9.5)		1/18 (5.5)		4/27 (14.8)		5/39 (12.8)		5/32 (15.6)		1.16	0.949	
Massage															
Neck	9/42 (21.4)		21/56 (37.5)		13/51 (25.4)		8/51 (15.6)		11/43 (25.5)		6/28 (21.4)		9.95	0.077	
Shoulder	11/47 (23.4)	a	24/64 (37.5)	b	14/55 (25.4)	a	10/55 (18.1)	a	12/60 (20.0)	a	7/37 (18.9)	a	13.69	0.018	*
Lower back	9/52 (17.3)	a	25/70 (35.7)	b	14/68 (20.5)	a	12/61 (19.6)	a	11/55 (20.0)	a	9/51 (17.6)	a	17.47	0.004	*
Knee	2/16 (12.5)		4/21 (19.0)		3/18 (16.6)		4/27 (14.8)		3/39 (7.6)		2/32 (6.2)		9.66	0.085	

parts and age groups regarding the utilization of acupuncture clinics, orthopedic clinics, and chiropractic care.

Regarding massage usage, significant differences among age groups were observed for both the shoulder and lower back (Shoulder: $\chi 2 = 14.546$, $p = 0.012$; Lower Back: $\chi 2 = 18.927$, $p = 0.002$). Specifically, individuals in their 30 s had notably higher rates of shoulder (37.5%) and lower back pain (35.7%).

Table 5 shows the proportion of individuals who underwent rehabilitation among those who visited a hospital, broken down by body part: the knee showed the highest (44.2%) while the wrist displayed the lowest (20.0%) proportion. Upon comparison between body parts, no significant difference was found ($\chi 2 = 12.003$, $p = 0.10$).

DISCUSSION

This study examined intergenerational differences among individuals with chronic pain and found no age-related differences in those with pain in one or more sites of the body. Previous research has reported a higher prevalence of pain among the elderly (*Hattori, 2006*; *Matsudaira, 2011*), while other studies have indicated its greater occurrence in

Table 5 Comparison of body site with the "hospital visit rehabilitation rate". Numbers indicate the number of people who underwent rehabilitation among those who visited a hospital. Values in parentheses are the proportion (percentage) of individuals who underwent rehabilitation among those who visited a hospital.

	n	%
Neck	24/64	(37.5)
Shoulder	30/71	(42.3)
Elbow	6/21	(28.6)
Wrist/Hand	7/35	(20.0)
Lower back	43/118	(36.4)
Hip joint	6/29	(20.7)
Knee	23/52	(44.2)
Ankle/Foot	8/31	(25.8)

middle-aged individuals in their 30 to 50 s (*Nakamura et al., 2011*). This survey focused on the musculoskeletal system and anticipated that a higher number of younger individuals would experience pain at one or more sites in the body. However, the actual results contradicted this expectation. This discrepancy may have arisen due to a recent amendment in the guidelines of the International Association for the Study of Pain that now defines chronic pain as pain lasting 3 months or longer. At the time of publication of a study by *Nakamura et al. (2011)* chronic pain was identified as that persisting for 6 months or more. Adhering to the new guidelines, the present study classified pain lasting 3 months or more as chronic pain. This adjustment potentially broadened the scope of individuals identified as having chronic pain compared to prior studies. Indeed, compared to the 10% to 20% prevalence reported in the *Nakamura et al. (2011)* survey, the current study indicates a higher prevalence, ranging from 25% to 35%. This suggests that our study categorizes individuals with milder symptoms as having chronic pain.

Next, a comparison was made regarding the number of pain sites among different age groups with chronic pain. The results revealed that individuals in their 30 s reported pain in three or more areas more frequently, whereas fewer instances were noted in those in their 70 s. The presence of pain in three or more areas suggests a significant burden on the body, indicating a condition that is difficult to heal. Individuals with pain in three or more areas were interpreted as having severe chronic pain. From this perspective, the prevalence of severe chronic pain in middle-aged patients was consistent with the findings of previous studies. Despite amendments to the guidelines related to chronic pain, the results of this study do not contradict those of previous research. Therefore, the results of this study can be interpreted based on the findings of previous studies.

When analyzing the prevalence of chronic musculoskeletal pain across different body regions, significantly higher rates were noted in the lower back, shoulders, and neck, and this is consistent with previous studies. Bipedalism, unique to human beings, is posited as a potential cause of this pain distribution (*Plomp et al., 2015*). Specifically, the postural demands of a bipedal stance and the spinal curvature during ambulation can exert

significant stress on the torso and cervical areas, potentially predisposing the lower back and neck to chronic pain. Moreover, bipedalism has granted human beings greater upper-limb mobility, expanding the range of motion in the shoulders. This increased mobility could lead to augmented stress on the shoulders, thereby increasing their susceptibility to pain. Thus, as the level of human activity intensifies, the propensity for chronic pain in the shoulders, lower back, and knees may increase. Notably, middle-aged individuals with higher activity levels exhibit a pronounced prevalence of pain in the shoulders, lower back, and neck. This underscores the possibility that heightened activity could be a salient factor underlying the elevated incidence of pain in these regions in the younger population.

Conversely, the incidence of chronic knee pain tends to increase with age. One plausible cause of this increase is the cumulative strain on the lower limbs due to weight bearing. The knee, with its limited joint flexibility, is presumed to be significantly affected by this strain. Furthermore, the knee is significantly influenced by bipedalism. Therefore, the effects of bipedalism should be considered when identifying the causes of knee pain. Strain in the musculoskeletal system due to daily human activities can be regarded as a contributing factor to chronic pain. In light of the above, understanding and taking appropriate measures to prevent the onset of musculoskeletal chronic pain, and to address it when it occurs, are essential for maintaining and improving health.

Focusing on the healthcare service gap issue and examining the presence or absence of treatment for chronic pain, it was revealed that about 50% of the participants did not undertake specific treatment. Furthermore, the presence or absence of treatment did not demonstrate any differences based on location in the body or age. From these survey results, it can be inferred that a service gap in chronic musculoskeletal pain consistently exists, irrespective of body location and age group, affecting approximately half of the participants.

When examining treatment actions by age, the hospital consultation rate was found to be lower among younger individuals, particularly those in their 30 s, and increased with age. Specifically, only approximately 20% of individuals in their 30 s who were experiencing back, shoulder, and neck pain consulted a hospital. This consultation rate is nearly equivalent to the reported consultation rates for depression and eating disorders in psychology (*Cachelin & Striegel-Moore, 2006*). Meanwhile, the use of massage therapy was higher in individuals in their 30 s than in other age groups. This could reflect the elevated levels of daily chores and increased time management challenges faced by the working-age population. Previous studies on back pain have clarified the effectiveness of early intervention (*O'Connell et al., 2016*), emphasizing the importance of early treatment for chronic musculoskeletal pain. While massage may provide temporary relief, cases requiring specialized treatment through hospital consultation are anticipated. Despite this, the trend of the working-age population in their 30 s to avoid hospital consultation and opt only for massage may lead to labor loss, particularly presenteeism. Considering this background, the medical consultation behavior of the working-age population in their 30 s with chronic musculoskeletal pain is likely to have a significant socioeconomic impact.

Among the patients with chronic pain who consulted a hospital, only approximately 30% underwent rehabilitation, with no observed differences related to the location of pain. According to a recent systematic review, rehabilitation centered on exercise therapy is recommended as a nonpharmacological treatment for chronic pain (*Ambrose & Golightly, 2015*; *Geneen et al., 2017*). Therefore, encouraging early rehabilitation in patients with chronic musculoskeletal pain should be considered as an initiative aimed at improving pain. However, despite the demonstrated effectiveness of evidence-based rehabilitation, there is concern that approximately 70% of patients with chronic pain who have consulted a hospital have not undergone rehabilitation. This situation is not believed to stem from issues of patient knowledge or awareness, but rather from problems on the side of healthcare providers. Specifically, the lack of awareness on the part of physicians that chronic pain can be alleviated through rehabilitation and the existence of therapists lacking adequate rehabilitation techniques for chronic pain treatment are notable issues. Furthermore, the lack of sharing of the latest knowledge and techniques related to chronic pain among healthcare professionals has been cited as a major factor. Thus, it is essential for healthcare providers to acquire specialized knowledge and skills related to chronic musculoskeletal pain and to enhance communication among staff.

Limitations

In this study, it was revealed that approximately half of the participants who had been experiencing chronic musculoskeletal pain for more than 3 months did not undergo any treatment, highlighting the issue of a service gap in the field of chronic musculoskeletal pain. However, because this was a cross-sectional survey, specific information regarding the duration of pain persistence could not be obtained. Hence, the details of individuals with long-standing chronic musculoskeletal pain remain unclear. To address the service gap issue accurately, responses that consider the severity of chronic pain symptoms, extent of the impact on daily life, and association with mental health are necessary. Although this study was able to estimate the severity based on the number of sites of chronic musculoskeletal pain in the body and showed trends by age group, a detailed investigation regarding the actual severity of symptoms and the impact of pain on daily life and mental health has not been conducted. Therefore, based on the results of this study, further studies are warranted to address the service gap issue.

CONCLUSIONS

This study revealed that approximately 50% of patients with chronic musculoskeletal pain did not undergo treatment. Furthermore, the presence or absence of these treatments showed no significant differences based on the affected body site or age group. These findings suggest the possibility of a consistent healthcare service gap in the management of chronic musculoskeletal pain for patients in Japan, irrespective of the affected site or age group.

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The authors declare that they have no competing interests. None of the authors are employees of Cross Marketing, Inc. Yasumasa Oka is an employee of the Kanazawa Orthopedic and Sports Medicine Clinic. Noriyuki Kida is an employee of the Kyoto Institute of Technology. Michio Wachi and Takumi Jiroumaru is an employee of the Bukkyo University.

Author Contributions

- Yasumasa Oka conceived and designed the experiments, performed the experiments, analyzed the data, prepared figures and/or tables, and approved the final draft.
- Takumi Jiroumaru conceived and designed the experiments, authored or reviewed drafts of the article, and approved the final draft.
- Michio Wachi conceived and designed the experiments, analyzed the data, authored or reviewed drafts of the article, and approved the final draft.
- Noriyuki Kida conceived and designed the experiments, performed the experiments, analyzed the data, prepared figures and/or tables, and approved the final draft.

Human Ethics

The following information was supplied relating to ethical approvals (*i.e.*, approving body and any reference numbers):

Ethics Committee of the Kanazawa Orthopedic Sports Medicine Clinic (Kanazawa-OSMC-2022-007).

Data Availability

The following information was supplied regarding data availability:

The raw measurements are available in the Supplemental File.

Supplemental Information

Supplemental information for this article can be found online at http://dx.doi.org/10.7717/peerj.18389#supplemental-information.

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