Knowledge and Attitude of Malaysian Physiotherapists towards the Use of Ultrasound Imaging In the Physiotherapy Management Of Cervicogenic Headache

Dr Syed Abudaheer[1], Dr Esha Arora[2], Yu Chye Wah[3], Pavitra Sandaranggan[4*]

[1,2,3,4] School of Physiotherapy, Faculty of Allied Health Professions, AIMST University, Malaysia
Email: syedabudaheer@aimst.edu.my[1], esha@aimst.edu.my[2],
chyewah@aimst.edu.my[3], pavitra_sandaranggan@aimst.edu.my[4]
*Corresponding Author

ABSTRACT

Background: The study aims to explore Malaysian physiotherapists' knowledge, attitudes, and utilization of Musculoskeletal Ultrasound Imaging in treating (CGH), identifying the limitation could potentially impede the widespread adoption of this imaging technique in clinical settings and lack of adequate training opportunities for physiotherapist in Musculoskeletal Ultrasound Imaging.

Method: This was a cross-sectional study design consisting of an using an online survey of 303 Malaysian physiotherapists who were currently working in Malaysia. The survey was recruited through an orchestrated campaign utilizing popular social media platforms.

Result: The study involved 303 participants, with 59.7% female and 40.3% male, showing a higher female participation rate. Participants were evenly spread across age groups, with the largest group aged 31-35 (30.4%). Most participants held a Degree (mean = 62%, standard deviation = 20.4%) or a Diploma (mean = 21.8%, standard deviation = 10.2%), indicating a highly educated sample. Only a small fraction had a Doctor of Philosophy degree (mean = 1.3%, standard deviation = 2.1%) or other credentials (mean = 0.3%, standard deviation = 1.5%). An analysis of knowledge levels showed that the majority (mean = 81.5%, standard deviation = 12.7%) scored below 60%, indicating a low level of knowledge in USI. Conversely, only a small fraction (mean = 4%, standard deviation = 3.2%) demonstrated high expertise.

Conclusion: The study underscores a significant knowledge gap and varying attitudes towards USI among Malaysian physiotherapists. It emphasizes the importance of educational and infrastructural enhancements to foster its adoption in CHG management.

Keywords: Musculoskeletal Ultrasound Imaging, Malaysia, Cervicogenic Headaches.

INTRODUCTION

Musculoskeletal ultrasound imaging (MSKUSI) has emerged as a valuable diagnostic tool in physiotherapy practice, offering non-invasive visualization of internal body structures [1]. While traditionally utilized by radiologists, MSKUSI has garnered interest from various medical specialties, including physiotherapy [2]. Despite its potential, integration into Malaysian physiotherapy practices is hindered by various barriers such the lack of adequate training opportunities for physiotherapist in MSKUS. Without proper training, physiotherapist may lack the necessary skills and confidence to effectively utilize ultrasound imaging in their practice [2].CGH is, characterized by pain originating from cervical spine disorders and is a common condition managed by physiotherapists [2, 3]. Traditionally dominated by radiologists, MSKUSI is now recognized across medical disciplines for its diagnostic precision and therapeutic guidance [2]. Because of its, non-invasive nature, ability to provide real-time imaging, and portability it makes an invaluable asset in physiotherapy [2]. Despite its benefits, the integration of MSKUSI into physiotherapy, especially for cervicogenic headache management, is hindered by knowledge gaps and attitudinal barriers among practitioners [3, 4].MSKUSI, also referred to as diagnostic sonography, employs high-frequency sound waves to generate images of the body's internal structures, including muscles, tendons, ligaments, joints, and surrounding soft tissues [5]. These images aid in the assessment and diagnosis of various musculoskeletal conditions, including injuries, inflammations, degenerative changes, and pathological abnormalities [6]. The diagnostic utility of MSKUSI lies in its capacity to visualize anatomical structures dynamically, allowing for the detection of abnormalities such as tears, fluid accumulations, or inflammation in real-time [6]. The evolution of MSKUSI has been marked by significant milestones, including advancements in technology, improvements in image resolution, and the development of

specialized probes and transducers tailored for musculoskeletal imaging (8). Additionally, the establishment of international symposiums and conferences dedicated to MSKUSI has played a pivotal role in fostering collaboration, disseminating knowledge, and standardizing practices within the field [8]. In the context of physiotherapy, MSKUSI promises as a valuable adjunct to clinical assessment and treatment planning. Physiotherapists can utilize ultrasound imaging to visualize musculoskeletal structures, assess tissue integrity, guide interventions such as injections or needling techniques, and monitor the effectiveness of therapeutic interventions over time [7, 8]. Moreover, MSKUSI enables physiotherapists to engage patients in their care by providing visual feedback and enhancing patient understanding of their condition [8]. CGH represent a common musculoskeletal condition encountered by physiotherapists in clinical practice. These headaches arise from disorders or dysfunctions in the cervical spine and surrounding musculature, leading to referred pain in the head and neck region [3]. By visualizing anatomical structures in the cervical spine and surrounding soft tissues, MSKUSI can aid in identifying underlying pathologies, assessing tissue integrity, and guiding therapeutic interventions tailored to individual patient needs [9]. In summary, MSKUSI represents a valuable imaging modality with diverse applications in physiotherapy practice, including the management of CGH [10]. By enhancing diagnostic accuracy, guiding interventions, and facilitating patient engagement, MSKUSI has the potential to revolutionize musculoskeletal assessment and treatment strategies in physiotherapy [11]. However, to fully realize its benefits, physiotherapists must possess adequate knowledge, skills, and access to training and resources to effectively integrate MSKUSI into clinical practice. The study aims to explore the knowledge and attitudes of Malaysian physiotherapists towards MSKUSI in managing CGH is crucial for optimizing patient care and treatment outcomes.

Methods
Study Design
A cross-sectional survey was conducted among 303 Malaysian physiotherapists, utilizing an online questionnaire disseminated through social media platforms. The survey encompassed knowledge, attitude, and factors identifying barriers to MSKUSI usage.The inclusion criteria were stringent to ensure a homogenous participant group relevant to the research question; therefore, only those physiotherapists who were currently practicing in Malaysia were considered. Conversely, the study excluded other healthcare professionals to maintain a focused insight into the physiotherapeutic perspective.

Sampling Method
This study employed a convenience sampling method, a strategic choice that capitalized on the accessibility of physiotherapists who were readily available to participate in an online survey.To quantify the extent of the sampling, the research employed the sophisticated Qualtrics Statistical Application [11]. The tool enabled the researchers to calculate an estimated sample size that was statistically significant, considering the entire population size of 1416 Malaysian physiotherapists [12]. With (95%) of level of confidence interval and a narrow margin for error (5%), the sample size calculated was 303 participants.

Tools and Materials
Ethical approval was obtained from the relevant institutional review board prior to data collection. Informed consent was obtained from all participants before they completed the survey, and measures were taken to ensure the confidentiality and anonymity of participants' responses.The study aimed to assess Malaysian physiotherapists' knowledge and attitudes towards ultrasound imaging for CGH. The cross-sectional survey used an online platform and involved seven phases; conceptualization, item generation, pilot testing, content validity, construct validation, internal consistency reliability, and finalization. The conceptual framework was grounded in the tripartite model of knowledge, attitudes, and factors that influence (KAF), was particularly relevant to this study. The survey component assessed baseline knowledge of ultrasound imaging among physiotherapists and their attitudinal stance toward its use for CGH. Subsequent interviews aimed to identify the range of factors influencing their willingness or reluctance to integrate ultrasound imaging into their practice. The choice of mixed methods provided a comprehensive exploration of physiotherapists' perspectives.The survey development phase involved the generation of survey items, which were methodically structured to incorporate elements pertinent to the current study's aims. The survey was composed of three primary sections:
- Participant demographics
- Knowledge about ultrasound imaging in relation to cervicogenic headaches
- Participants' attitudes towards the use of ultrasound imaging in clinical practice

The pilot testing phase was a critical juncture in the research methodology, serving to validate and refine the survey instrument developed in the previous step. The study employed the Delphi Method, a systematic and the expert panel was made to review the article and the suggestions from them were incorporated for the study. The pilot test with 10 participants was conducted to assess the clarity, relevance, and coherence of the questionnaire. The final report reflected a polished survey instrument ready to yield valuable data for the study's subsequent

analyses.An online-based survey was utilized as the primary data collection method. The survey link was made accessible for a period of four weeks to allow participants ample time to respond. A reminder message was sent to all potential participants one week after the initial distribution of the survey link, and a second reminder was dispatched on the fourth week to capture any remaining respondents who had not completed the survey.The survey questionnaire was designed to assess participants' knowledge and attitudes towards the use of ultrasound imaging in physiotherapy practice, specifically in the management of CGH. The questionnaire included items related to participants' demographic information, educational background, years of experience, current workplace setting, and familiarity with ultrasound imaging techniques. Additionally, participants were asked to rate their level of knowledge and confidence in utilizing ultrasound imaging for diagnostic and therapeutic purposes.

Data Analysis
Statistical Package for the Social Sciences (IBM SPSS, Version 20) was used for data analysis. We completed descriptive statistics, which were utilized to summarize participants' demographic characteristics and responses to survey items. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were computed for continuous variables. Inferential statistical analyses, GLM Univariate, were used to model the linear relationship between a dependent scale variable, chi-square tests, and one–way ANOVA, which were performed to examine associations between demographic factors and knowledge or attitudes towards ultrasound imaging.All analyses were conducted using appropriate statistical software, with significance set at $p < 0.05$.

Results
Participant Characteristics

Table 1: Demographic characteristics of participants (n=303)

	Frequency	Percentage (%)
Gender		
Male	122	40.3
Female	181	59.7
Age category		
20 - 25	63	20.8
26 – 30	72	23.8
31 – 35	92	30.4
36 – 40	50	16.5
41 – 45	15	5.0
46 – 50	6	2.0
>50	5	1.7
Current working place		
Kedah	45	14.9
Penang	62	20.5
Perak	19	6.3
Selangor	38	12.5
Negeri Sembilan	17	5.6
Malacca	20	6.6
Johor	23	7.6
Kelantan	12	4.0
Terengganu	11	3.6
Pahang	12	4.0
Kuala Lumpur	30	9.9
Sabah	6	2.0
Sarawak	2	0.7
Perlis	6	2.0
Educational background		
Diploma	66	21.8
Degree	188	62.0
Master	44	14.5
PhD	4	1.3
Other	1	0.3
Area of work		
Government sector	68	22.4

Private hospital	56	18.5
Private centre	78	25.7
University	48	15.8
Sport team	15	5.0
Research facility	7	2.3
Community	14	4.6
Locum	11	3.6
Other	6	2.0
Year of experience (years)		
0 – 5	116	38.3
6 – 10	125	41.3
11 – 15	49	16.2
16 or more	13	4.3
Area of practice/ speciality		
Musculoskeletal	158	52.1
Neurology	36	11.9
Cardiorespiratory	26	8.6
Sport physiotherapy	56	18.5
Paediatrics	10	3.3
Women health	6	2.0
Hand surgery	4	1.3
Occupational health	7	2.3

*Note: n = Sample size

Table 1 showed total of 303 Malaysian physiotherapists participated in the study, with 59.7 %(181) being female and 40.3% (122) male. The majority of respondents were aged between 31-35 years 30.4% (92), with a smaller proportion over 50 years 1.7% (5). Regarding educational background, most participants held a degree 62% (188), followed by those with a diploma 21.8% (66). In terms of workplace setting, the largest number of participants worked in private centres which is 25.7% (78), followed by the government sector were 22.4% (68) and private hospitals was 18.5% (56). Additionally, the majority of participants had 0-10 years of experience, with 38.3% (116) having 0-5 years and 41.3% (125) having 6-10 years of experience.

Knowledge and Attitudes towards Ultrasound Imaging

Table 2: Understanding of ultrasound imaging and perceived barriers

	Frequency	**Percentage (%)**
Understanding of Musculoskeletal ultrasound imaging in physiotherapy practice		
Evaluate the progress	67	22.1
Evaluate soft tissue injuries	57	18.8
Biofeedback	34	11.2
Assist in making a diagnosis and/or pathology	59	19.5
As a research tool		
Evaluating muscle structure 9e.g. shape, pennation angle, muscle fasciae length, fatty infiltration etc)	25	8.3
	32	10.6
Other		
Not sure	4	1.3
	25	8.3
Region of body routinely image		
Lower limb	52	17.2
Upper limb	74	24.4
Anterolateral abdominal wall	43	14.2
Multifidus and/or other spinal extensors	11	3.6
Pelvic floor and/or bladder	20	6.6
Lumbosacral region	28	9.2
Cervical spine region	24	7.9
Diaphragmatic/respiratory muscles	12	4.0
Thoracic spine region	8	2.6

Other (e.g. face, bowel, lung)	31	10.2
Barriers in using ultrasound imaging		
Not been trained to use ultrasound imaging	109	36.0
No ultrasound equipment on site		
The equipment is expensive	53	17.5
No confidence in using ultrasound imaging	26	8.6
No specific remuneration available for providing an ultrasound imaging service	39	12.9
Lack of support from management	24	7.9
Don't understand the potential uses for ultrasound imaging in clinical practice	20	6.6
Patients are not willing to pay for ultrasound imaging	17	5.6
Lack of supervision in the use of ultrasound imaging	5	1.7
	10	3.3

Table 2 revealed varied understanding and attitudes towards ultrasound imaging among Malaysian physiotherapists. While a significant portion of respondents (22.1%) identified its use in evaluating treatment progress, 19.5% recognized its utility in assisting with diagnoses and identifying pathologies. Additionally, 10.6% of participants acknowledged ultrasound as a research tool, and 11.2% cited its usefulness for biofeedback purposes. However, 8.3% of participants indicated a need for more awareness of ultrasound imaging's applications, suggesting a potential gap in knowledge or experience.

Table 3: Level of knowledge in different categories (n=303)

	Category	Score (%)*	n	%	χ^2 (df)	p
Knowledge	High	12 – 15 (80%-100%)	12	4		
	Moderate	9 -11 (60%-79%)	44	14.5	321.644 (2)	0.000
	Low	<9 (<60%)	247	81.5		
Total			303	100		

Table 3 shows the analysis of participants' knowledge levels and it revealed a significant disparity. A small fraction of the sample (4%) demonstrated a high level of knowledge in ultrasound imaging, scoring between 80% and 100%. A slightly higher segment (14.5%) exhibited moderate knowledge, with scores ranging from 60% to 79%. However, most participants (81.5%) were categorized as having low knowledge, scoring below 60%. These results were statistically significant, with a chi-square (χ^2) value of 321.64 (df = 2) and a p-value of 0.000, indicating a substantial variation in knowledge levels among the study participants.

Table 4: Factors influence the knowledge towards the use of ultrasound imaging in themanagement of cervicogenic headache

Factors	Number of participants (n)	Percentage (%)	df	F	P value
Severity and duration of symptoms	81	26.7			
Response to previous treatment	48	15.8			
Patient preference	41	13.5			
Availability of imaging facilities	64	21.1	5, 297	2.075	0.068
Diagnostic uncertainty	36	11.9			
Concerns about underlying pathology	33	10.9			

*Note:df =degree of freedom, n= sample size, F= f-value, p= p-value.

Table 4 showed the analysis that the severity and duration of symptoms were considered by 26.7% of participants, suggesting a moderate influence on their knowledge towards ultrasound imaging use, with a F-value of 2.075 and p-value of 0.068, indicating a trend towards significance. Other factors, such as the

availability of imaging facilities (21.1%) and response to previous treatment (15.8%), also impacted knowledge. Patient preference, diagnostic uncertainty, and concerns about underlying pathology were less frequently cited, indicating varied perceptions on the relevance of these factors in influencing knowledge.

Table 5: Factors influence the attitude towards the use of ultrasound imaging in themanagement of cervicogenic headache

Factors	Number of participants (n)	Percentage (%)	df	F	P value
Severity and duration of symptoms	81	26.7			
Response to previous treatment	48	15.8			
Patient preference	41	13.5			
Availability of imaging facilities	64	21.1	5, 297	14.275	0.000
Diagnostic uncertainty	36	11.9			
Concerns about underlying pathology	33	10.9			

*Note:df =degree of freedom, n= sample size, F= f-value, p= p-value.

Table 5 showed the analysis identified several key factors that significantly influence attitudes towards ultrasound imaging. The severity and duration of symptoms emerged as the most influential factor, cited by 26.7% of participants, with a notably high F-value of 14.275 and p-value of 0.000, indicating a statistically significant impact. The availability of imaging facilities was also substantial, affecting 21.1% of participants' attitudes. Other factors, including response to previous treatment, patient preference, diagnostic uncertainty, and concerns about underlying pathology, varied in their influence on attitudes, highlighting the complexity of factors that physiotherapists consider in their appraisal of ultrasound imaging.

DISCUSSION
This study examines Malaysian physiotherapists' knowledge and attitudes toward ultrasound imaging for managing cervicogenic headaches, providing significant implications for physiotherapy practice and education in Malaysia. Demographic distribution of participants indicates a relatively young professional group, with a majority in the early stages of their careers (0-10 years of experience). This demographic profile is crucial for understanding the potential for growth and learning within the profession, particularly regarding new diagnostic tools like MSKUSI [4]. The significant representation from private centres and the government sector reflects a broad interest and potential for MSKUSI application across diverse practice settings in Malaysia. It revealed a notable disparity in knowledge levels about MSKUSI among participants, with a significant majority demonstrating low knowledge levels [4]. This gap underscores the urgent need for educational interventions tailored to enhance physiotherapists' understanding and application of MSKUSI in clinical practice.
A variety in attitudes towards MSKUSI, with some recognizing its utility in diagnosis, treatment evaluation, and as a biofeedback tool, while others express a desire for increased awareness, suggests a foundational interest in MSKUSI that could be cultivated through targeted training and resources [3]. Addressing the identified knowledge gaps and attitudes towards USI is essential for improving the quality of care provided by physiotherapists and optimizing patient outcomes [1]. Our study showed that the influence of factors such as severity and duration of symptoms and the availability of imaging facilities on physiotherapists' knowledge points to the complexity of clinical decision-making in cervicogenic headache management.
These findings suggest that practical considerations, such as access to technology and patient outcomes, significantly affect physiotherapists' engagement with and attitudes towards MSKUSI [5]. Enhancing access to MSKUSI technology and integrating it into physiotherapy education and practice settings may address some of these knowledge gaps [4, 5]. Comprehensive educational interventions and training programs tailored to the specific needs of physiotherapists should be developed to enhance their knowledge and skills in ultrasound imaging techniques and applications [5, 6]. Efforts should also be made to increase access to ultrasound imaging facilities and equipment in healthcare institutions to facilitate its use in clinical practice [7].
Furthermore, official authorization of physiotherapists to perform ultrasound imaging procedures may be necessary to ensure safe and effective practice [8]. Future research should focus on evaluating the effectiveness of educational interventions in improving physiotherapists' knowledge and attitudes towards USI, as well as exploring the factors influencing their perceptions and experiences with ultrasound imaging in more depth [9]. Overall, addressing the knowledge gaps and negative attitudes towards ultrasound imaging identified in this study is crucial for enhancing the integration of USI into physiotherapy practice in Malaysia and improving patient care and outcomes in the management of cervicogenic headaches and other musculoskeletal disorders [10].

Several factors were identified as potential barrier of physiotherapists' knowledge and attitudes towards ultrasound imaging [11]. These include the severity and duration of symptoms, availability of imaging facilities, response to previous treatment, patient preference, diagnostic uncertainty, and concerns about underlying pathology. Demographic factors such as age, gender, educational background, years of experience, and specific work area also played a role in shaping participants' perspectives. Understanding these factors is essential for developing targeted educational interventions and training programs to address knowledge gaps and improve attitudes towards USI [11].

Recommendations for Practice and Education
Based on the study findings, several recommendations can be made to enhance the integration of ultrasound imaging into physiotherapy practice in Malaysia. Firstly, there is a need for comprehensive educational interventions and training programs to improve physiotherapists' knowledge and skills in ultrasound imaging techniques and applications. These programs should be tailored to the specific needs of physiotherapists based on their demographic characteristics and practice settings. Additionally, efforts should be made to increase access to ultrasound imaging facilities and equipment in healthcare institutions to facilitate its use in clinical practice. Official authorization of physiotherapists to perform ultrasound imaging procedures may also be necessary to ensure safe and effective practice [6].

Limitations
It is essential to acknowledge the limitations of this study, including its cross-sectional design and reliance on self-reported data. Future research could employ longitudinal or experimental designs to investigate the effectiveness of educational interventions in improving physiotherapists' knowledge and attitudes towards ultrasound imaging. Additionally, qualitative studies could provide deeper insights into the factors influencing physiotherapists' perceptions and experiences with ultrasound imaging. Overall, addressing the knowledge gaps identified in this study is crucial for enhancing the quality of care provided by physiotherapists and improving patient outcomes in Malaysia.

CONCLUSION
The analysis revealed a lack of knowledge and negative attitudes towards ultrasound imaging among Malaysian physiotherapists. Educational interventions and training programs are needed to address these issues and facilitate better utilization of ultrasound imaging in practice. Tailored approaches may be necessary based on demographic factors such as educational background, age, and gender. Additionally, infrastructure support and official authorization of physiotherapists are essential for the safe and effective integration of ultrasound imaging into practice.

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