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ORIGINAL RESEARCH ARTICLE

Open Access



Knowledge, attitude, and perception of Nigerian-based physiotherapists on the utilization of musculoskeletal ultrasound imaging in the clinical management of musculoskeletal conditions

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Abstract

Background Musculoskeletal ultrasound imaging (MSUI) is an efficient monitoring and re-evaluation tool used for the management of musculoskeletal conditions in several clinical domains. Its utilization among physiotherapists, particularly in African countries, is yet to be explored.

Objective This study investigated the knowledge, attitude, and perception of physiotherapists on the utilization of MSUI in the clinical management of musculoskeletal conditions.

Methods One hundred and ninety-two consenting Nigerian-based physiotherapists practicing in public and private health institutions participated in this cross-sectional survey. They responded to a three-sectioned structured questionnaire, investigating socio-demographic and occupational characteristics, knowledge, attitude, and utilization of MSUI for the management of musculoskeletal conditions. Data were analyzed with descriptive statistics and Pearson's chi-square test at a significant level of 0.05.

Results The majority (79.2%) of the respondents had positive knowledge of MSUI and its benefits as a clinical modality for managing MSCs. However, only 4.2% had utilized MSUI in clinical practice. Non-utilization of MSUI was commonly attributed to a lack of access to MSUI (60.3%) and its unavailability in most diagnostic centers (42.9%). Almost all (99.0%) of them agreed to the necessity for increased availability of MSUI to physiotherapists for enhancement of physiotherapy interventions in the management of MSCs.

Conclusion Knowledge of MSUI among Nigerian-based physiotherapists is adequate, but its utilization as a clinical tool is poor. Improved availability of MSUI to physiotherapists is necessary as well as specialty training on the utilization and interpretation of MSUI.

Keywords Attitude, Knowledge, Musculoskeletal ultrasound imaging, Nigeria, Perception, Physiotherapists

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Introduction

The musculoskeletal system, an interaction among soft tissues, determines several factors including human locomotion, dexterity, and the ability to work and actively participate in all aspects of life as well as the ability to maintain economic, social, and functional independence across life course [1]. Adequate musculoskeletal health is essential to enable physical activity, an essential strategy to reduce the risk of other non-communicable diseases [1]. In the course of daily life activities, this system sustains injuries that if not duly attended to could lead to disabilities. Musculoskeletal conditions (MSCs) or disorders are degenerative diseases and inflammatory conditions that cause pain and impairment of normal activities of daily living [2]. The commonly affected soft tissues include joints, muscles, nerves, and tendons. They are the most common cause of severe long-term pain and physical disability that affects hundreds of millions of people around the world [3, 4], and significantly alter the psychosocial status of affected individuals, their caregivers, and families at large. In addition, they constitute major burdens on the affected individuals, health care, and social care systems [3, 5].

Multi-disciplinary clinical management approaches are usually recommended and utilized for the effective management of MSCs. Physiotherapists (PTs) are integral members of the multi-disciplinary team responsible for the management of MSCs. Successful physiotherapy practice is dependent on appropriate clinical decision-making which is necessary for effective management of MSCs and its success lies in proper assessment, diagnosis, establishment of treatment plans, and outcome measurements. Commonly, the main modalities of assessment, diagnosis, and outcome measurements utilized by PTs include subjective physical evaluations, pain rating scales, disability rating scales, and goniometry. Most, if not all, of these procedures are limited in the information they provide, considering their inability to provide real illustrations of the affected soft tissues. Rather, they suggest suspected musculoskeletal structures that may be responsible for the MSCs, resulting in unspecific and inaccurate diagnosis, trial and error clinical management regimes, and poor evaluation of treatment outcomes. These limitations may increase patient hospital stay durations as well as the frequency and duration of physiotherapy outpatient visits.

For improved assessment, diagnostic, and outcome measurement procedures, more sophisticated modalities, including magnetic resonance imaging (MRI), computed tomography scan (CT-scan), and x-rays, are employed in ascertaining the true pictures of the musculoskeletal tissues in the management of MSCs. However, these modalities are expensive, require extensive time

to complete a procedure, and can cause soft tissue damage due to prolonged exposure to ionizing radiations [6]. To control for these challenges, there was a need for a dynamic cost-effective imaging modality that offers real-time functions with minimal examination duration and risks for patients as well as the ability to be repeated severally as treatment progresses. This need resulted in an increased focus on musculoskeletal ultrasound imaging (MSUI). MSUI refers to the use of high-resolution sonography for the visualization and evaluation of soft tissues (muscles, ligament, joints, bursae) and detection of fluid collection and can also be used to visualize other structures such as cartilage and bony surfaces [7, 8]. It is most commonly used in the assessment of soft tissue diseases or detection of fluid collection as well as in visualizing other structures, including cartilage and bone surfaces [9, 10]. Additionally, it is used to monitor treatment outcomes and provide visual feedback during treatment to aid muscle contraction and relaxation [11]. The real-time capability of ultrasound allows for dynamic evaluation of joints and tendons, which can be a valuable assessment tool [11]. Furthermore, it can be effectively used for guidance and localization during joint aspirations, injections, and biopsies [11]. MSUI has been in existence since the nineteenth century but with less focus on its benefits until recently as improvements have been recorded in its image resolution [12]. Within the past decade, it has become an established imaging technique for the diagnosis and follow-up of patients with musculoskeletal diseases [13–15], relative to its technological improvements, resulting in faster computers and higher frequency transducers.

MSUI has become an increasingly important adjunct to clinical examination for physiotherapists in several countries [16]. It plays a crucial role in physiotherapy practice, particularly in enabling precise clinical diagnosis, injury management, and rehabilitation as well as treatment accuracy [16]. Particularly, physiotherapists use MSUI to assess soft tissue structure and functions, at rest, during exercises and physical tasks as well as for visual biofeedback procedures [17]. Education on MSUI principles is not an integral component of physiotherapy education in most Nigerian training institutions. Information on its utilization among physiotherapists in African health-care settings is also scarce. Thus, this study was designed to investigate the knowledge, attitude, and perception of Nigerian-based PTs on the utilization of MSUI in the clinical management of MSCs.

Materials and method

Participants

This study involved 192 licensed and practicing physiotherapists who were conveniently recruited from seven

(7) tertiary hospitals in southeast Nigeria. The sample size was determined by using the sample size calculation formula for a finite population by Yamane at a 95% confidence level, and the total number of Nigerian-based physiotherapists was represented as 6,071 [Data obtained from the Medical Rehabilitation Therapists Board of Nigeria (MRTBN)]. The exclusion criteria included non-registration with the Medical Rehabilitation Therapist Board of Nigeria (MRTBN), full-time clinical practice for less than 6 months, full-time academic PTs, and full-time practice outside Nigeria. This study was approved by the University of Nigeria's health research ethics committee, and all the respondents gave written informed consent before participation in the study.

Instrument for data collection

A structured questionnaire consisting of three sections, A, B, and C, was used for data collection. Section A and B sought information on the socio-demographic and occupational characteristics of the respondents, respectively, while section C investigated their knowledge of, attitude towards, and utilization of MSUI for the management of MSCs.

The face validity of the questionnaire was determined by three expert reviews. Its reliability was also tested with a test-retest method. Copies of the questionnaire were first administered to 15 PTs and were re-administered after 7 days. Its test-retest reliability yielded correlation coefficients of $r=0.960$ ($p=0.001$).

Data analysis

Data were summarized using descriptive statistics of mean, standard deviation, frequency, and percentage while inferential statistics of chi-square was used to determine the associations among variables. A statistical package for social sciences (SPSS, version 21) was used to analyze data.

Results

One hundred ninety-two out of the 200 PTs that were approached filled out the questionnaire, yielding a response rate of 96%. The mean age of respondents was 34.26 ± 7.00 years. Table 1 shows the general characteristics of the respondents. The majority were males (60.4%), within the age range of 31–40 years (48.4%), and had 6–10 years of clinical experience.

Knowledge of MSUI among the respondents is presented in Table 2. The majority (79.2%) of them knew MSUI. Their source of knowledge was predominantly from textbooks (38.0%).

The majority also had good knowledge of its functions. In Table 3, their level of knowledge of the benefits of MSUI was also presented. Respondents' perceptions of

Table 1 General characteristics of the respondents ($N=192$)

Variable	Frequency	Percentage (%)
Age (years)		
Under 30	62	32.3
31–40	93	48.4
41–50	33	17.2
Over 50	4	2.1
Gender		
Male	116	60.4
Female	76	39.6
Educational level		
First degree	149	77.6
Master's degree	34	17.7
Doctorate	9	4.7
Clinical experience		
< 6 months	4	2.08
6 months–1 year	25	13.03
1–5 years	57	29.68
6–10 years	66	34.38
11–15 years	23	11.98
16 years and above	17	8.85

the benefits of MSUI varied from one specified benefit to the other.

Table 4 presents data on the reported utilization of MSUI among the respondents. Only 8 (4.2%) PTs reported utilization of MSUI for the management of MSCs and the majority (62.5%) of them attributed its utilization to the suggestion of the referring physician. However, the majority of PTs that reported non-utilization of MSUI attributed its lack of access to MSUI (60.3%) and its unavailability in most diagnostic centers (42.9%).

Most of the PTs attested to the need for increased availability of MSUI to PTs (99.0%) as well as its possibilities of improving physiotherapy practices (98.4%) (Table 5).

Furthermore, statistical analyses showed no significant association between knowledge of MSUI and each of the respondents' age ($p=0.713$), level of education ($p=0.994$), and years of clinical experience ($p=0.112$) (Table 6). However, in Table 7, the results showed that utilization of MSUI was significantly associated with respondents' age ($p<0.001$), educational level ($p=0.021$), and years of clinical experience ($p=0.003$).

Discussion

This study assessed the knowledge of, attitude towards, and perception of PTs on the utilization of MSUI in the clinical management of MSCs. The majority of the PTs who participated in this study had positive knowledge of MSUI as well as its functions. Preponderantly, the results showed that the majority gained knowledge of

Table 2 Knowledge of musculoskeletal ultrasound imaging among physiotherapists ($N=192$)

Variable	Frequency	Percentage (%)
Knowledge of MSUI		
Yes	152	79.2
No	40	20.8
Source of information		
Clinical presentations	42	21.9
Media	48	25.0
Academic journals	72	37.5
Textbooks	73	38.0
Seminars/workshop/conferences	38	19.8
Colleague(s)	42	21.9
Other health care professionals	20	10.4
Clinical experience	8	4.2
Others	7	3.6
Functions of MSUI		
Diagnostic tool		
Yes	168	87.5
No	24	12.5
Tool for monitoring of treatment outcome		
Yes	163	84.9
No	29	15.1
Structures investigated with MSUI		
Muscle	153	79.7
Tendon	142	74.0
Bones	114	59.4
Joints	106	55.2
Nerve	83	43.2
Visceral organs	55	28.6

MSUI Musculoskeletal ultrasound imaging

MSUI via reading clinical textbooks and academic journals. Usually, the most available sources of information to clinical students are recommended textbooks and journal articles which supplement other methods of formal learning. However, it is expected that with the working experiences of the PTs, knowledge of MSUI would have also been gained through clinical experiences, continuing education, and inter-professional relationships with other healthcare personnel. This suggests the deficiency of MSUI in typical Nigerian clinical practices. Integrating MSUI training as a major component of formal physiotherapy training, particularly at undergraduate study levels, will be beneficial.

The results revealed that the majority of the PTs had adequate knowledge of the functions and benefits of MSUI. For instance, the positive responses on the ability to investigate musculoskeletal structures, particularly muscles, tendons, and joints, were high. Additionally, relative to the benefits of MSUI, the positive knowledge of the PTs on the benefits of MSUI enables the clinician to look directly at the soft tissues of the body, evaluate the internal structures and interfaces of muscles, and assess muscle contraction was high. These responses are concurrent with the PTs' positive knowledge of MSUI as a tool for the management of MSCs.

Contrary to their level of knowledge of MSUI, the majority of the PTs reported non-utilization of MSUI in their clinical practice. From their responses, the commonest barriers to MSUI utilization include lack of access to and unavailability of MSUI in the diagnostic centers affiliated with their institutions of clinical practice. Anecdotally, MSUI is not a common modality in most diagnostic centers in Nigeria. Regarding its uncommon utilization in Nigerian clinical practice, it

Table 3 Level of knowledge of the benefits of MSUI among the participants ($N=192$)

S/No	Variable	SA n (%)	A n (%)	I n (%)	D n (%)	SD n (%)
1	To look directly at the soft tissues of the body	90 (46.9)	69 (35.9)	30 (15.6)	3 (1.6)	-
2	To evaluate the internal structure (cross-sectional area and muscle thickness) and interfaces of muscles, in contrast to MRI and CT-scan	52 (27.1)	80 (41.7)	49 (25.5)	8 (4.2)	3 (1.6)
3	Assessment of muscle contractions and their effects on neighboring structures	54 (28.1)	66 (34.4)	56 (29.2)	10 (5.2)	6 (3.1)
4	Evaluate functions of the deep muscles	63 (32.8)	78 (40.6)	44 (22.9)	3 (1.6)	4 (2.1)
5	Used in biofeedback studies to evaluate the extent of muscle recruitment during conscious and unconscious activation	53 (27.6)	71 (37.0)	62 (32.3)	2 (1.0)	4 (2.1)
6	Examination of muscle atrophy and other muscle injuries (sprain and tears)	58 (30.2)	88 (45.8)	43 (22.4)	3 (1.6)	-
7	Examination of tendons and their related injuries	56 (29.2)	87 (45.3)	46 (24.0)	3 (1.6)	-
8	Evaluating structures of joints, adhesions, and other related joint dysfunctions	54 (28.1)	83 (43.2)	50 (26.0)	4 (2.1)	1 (0.5)
9	Examining peripheral and spinal nerves as well as their related abnormalities	45 (23.4)	68 (35.4)	66 (34.4)	6 (3.1)	7 (3.6)
10	MSUI is relatively cheaper than other tools used for clinical imaging (MRI, CT-scan)	46 (24.0)	62 (32.3)	71 (37.0)	9 (4.7)	4 (2.1)
11	MSUI is relatively safer than some commonly used diagnostic tools (X-rays)	50 (26.0)	80 (41.7)	58 (30.2)	3 (1.6)	1 (0.5)

Key: SA Strongly agree, A Agree, I Indifferent, SD Strongly disagree, MSUI Musculoskeletal ultrasound imaging

Table 4 Utilization of MSUI among the respondents (N = 192)

Variable	Frequency (%)
Utilization of MSUI (n = 192)	
Yes	8 (4.2)
No	184 (95)
Total	192 (100)
Reasons for choice of MSUI as a diagnostic tool (n = 8)	
Most available	1 (12.5%)
Suggestion from referring medical professional	5 (62.5%)
Patient's choice	0 (0%)
Patient's safety	1 (12.5%)
Cost-effectiveness	0 (0%)
Ability to directly view the structures of interest	0 (0%)
For accurate results	4 (50%)
Creation of opportunity for monitoring and documentation of soft tissue healing	2 (25%)
Effectiveness as a tool for evaluating effective practice	1 (12.5%)
Reasons for non-utilization of MSUI (n = 184)	
Lack of knowledge of MSUI	25 (13.6%)
Insufficient knowledge its procedures and benefits	52 (28.3%)
Lack of access to MSUI	111 (60.3%)
Unavailability in most diagnostic centers	79 (42.9%)
Not sure of its benefits	1 (0.5%)
Lack of trust in the accuracy of its results	0 (0%)
Expensiveness	4 (2.2%)
Unsafe for patients	0 (0%)
Cannot be used for instant assessment	3 (1.6%)
Outside the specified scope of practice for physiotherapists	4 (2.2%)

MSUI Musculoskeletal ultrasound imaging

Table 5 Perception of the participants on the need for MSUI as a clinical management tool (n = 192)

Variable	Frequency	Percentage (%)
Need for increased availability of MSUI to physiotherapists		
Yes	190	99.0
No	2	1
Possibilities of MSUI improving physiotherapy practices		
Yes	189	98.4
No	3	1.6

MSUI musculoskeletal ultrasound imaging

will be difficult for most diagnostic centers to procure it as there will be less economic benefit associated with it. This has affected its availability and access to clinicians, factors with the possibility of limiting its utilization as a clinical research tool. Education on the relevance of MSUI is highly recommended as this will likely increase

Table 6 Chi-square test results for the association among knowledge of MSUI and respondents' age, educational level, and clinical experience (N = 192)

Socio-demographic characteristics	Positive knowledge of MSUI	χ^2	P value
Age			
Under 30	49 (25.5%)	1.366	0.713
31–40	72 (37.5%)		
41–50	27 (14.06%)		
Over 50	4 (2.08%)		
Level of education			
First degree	118 (61.46%)	0.012	0.994
Master's degree	27 (14.06%)		
Doctorate degree	7 (3.65%)		
Clinical experience			
< 6 months	4 (2.08%)	8.937	0.112
6 months–1 year	20 (10.42%)		
1–5 years	47 (24.48%)		
6–10 years	51 (26.56%)		
11–15 years	18 (9.38%)		
≥ 16 years	12 (6.25%)		

Table 7 Chi-square test result for the association between the utilization of MSUI and respondents' age, educational level, and clinical experience (N = 192)

Socio-demographic characteristics	Utilization of MSUI	χ^2	<i>P</i> value
Age			
Under 30	2 (1.04%)	25.411	0.000*
31–40	1 (0.52%)		
41–50	3 (1.56%)		
Over 50	2 (1.04%)		
Educational level			
First degree	5 (2.60%)	7.721	0.021*
Master's degree	1 (0.52%)		
Doctorate	2 (1.04%)		
Clinical experience			
< 6 months	1 (0.52%)	18.347	0.003*
6 months–1 year	1 (0.52%)		
1–5 years	0		
6–10 years	1 (0.52%)		
11–15 years	2 (1.04%)		
≥ 16 years	3 (1.56%)		

*indicates significance at $p < 0.05$

referral rates for its utilization as well as improve its availability and access to clinicians.

Meanwhile, the few PTs who reported utilization of MSUI in the present study predominantly attributed this

practice to the suggestion of the referring medical professional. In Nigeria, physiotherapy practice is not on a first-contact basis [18, 19], thus limiting the abilities of PTs to make due referrals for investigations. Within their scope of practice, Nigerian PTs do not possess full entitlement to patient referral, as compared to physicians, despite the necessity of such referrals. Generally, these policies have negative effects on physiotherapy practice in Nigeria and need to be modified to encourage the effectiveness and efficiency of physiotherapy procedures. From the results of the present study, PTs' positive perceptions of the need for increased availability of MSUI to PTs as well as the possibilities of its utilization in improving physiotherapy practices corroborates these recommendations for modifications in Nigerian health-providing policies. Additionally, inter-professional education and socialization are encouraged for improved clinical practices in patient management.

Furthermore, this study revealed that age, level of education, and years of clinical experience are determinants of MSUI utilization among PTs. It was observed that PTs with only first degrees, older physiotherapists (41–50 years), and those with more working experiences (≥ 16 years) utilized MSUI more than the other categories. Age [20] and clinical experiences [20, 21] have been previously identified as factors influencing the choice of treatment modalities. However, considering the small sample size of the present study, further studies with larger sample sizes will provide more reliable associations among occupational characteristics, knowledge, and utilization of MSUI in physiotherapy practice.

Conclusion

Nigerian-based PTs have good knowledge of MSUI as a clinical tool for the management of MSCs. However, their utilization of MSUI is inadequate, commonly attributed to poor availability and access to MSUI. There is a need for improved inter-professional education on the relevance of MSUI as a clinical tool as well as modifications in some policies governing healthcare delivery in Nigeria.

Abbreviations

MSUI	Musculoskeletal ultrasound imaging
MSCs	Musculoskeletal conditions
PTs	Physiotherapists

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Not applicable

Authors' contributions

Ojukwu CP, Anekwo EM, and Ude-Bassey Z drew the design and concept of the study, including the data collection and data analysis; Onuchukwu CL, Ede SS, Chukwu SC, and Ojukwu CP did the data analysis and statistical analysis; Ede SS, Okemuo AJ, Eze JC, and Okafor CJ did the literature search, manuscript

preparation, and editing. All authors reviewed and approved the manuscript. Ojukwu CP is the "guarantor" for this study.

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Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to ethical reasons as it was not included in the participants' informed consent, but the data are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the University of Nigeria's health research ethics committee, and all the respondents gave written informed consent prior to participation in the study.

Competing interests

The authors declare that they have no competing interests.

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