An evaluation of the knowledge level of Nigerian physiotherapists on topical pharmacotherapy

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Abstract
Conventional treatment for some diseases involves a combination of pharmacotherapy and physiotherapy. Most of Nigeria’s training schools have introduced the course of pharmacology in their training curriculum but its effect is still unknown. There appears to be inadequate research on physiotherapists’ knowledge of medications in Nigeria. The primary objectives of this study were to determine the knowledge of Nigerian physiotherapists regarding topical pharmacotherapy and to determine the association between knowledge of active ingredients and age, clinical experience, qualification, and work setting. A total of 135 practising physiotherapists participated in the cross-sectional survey study. A self-administered questionnaire was used for this study. Descriptive statistics and Pearson chi-square were used to analyse the data obtained. Only 55 respondents (40.7%) reported that they recently updated their knowledge on topical medications; however, this contradicted the finding that only one participant (0.7%) had very good knowledge while 57 respondents (42.2%) have poor knowledge of the active ingredients in the topical medications listed in this study. Also, 105 respondents (77.8%) indicated their awareness that physiotherapists can recommend topical drugs. The results of this study revealed that some of the sampled physiotherapists have poor knowledge about adverse reactions, contraindications, risks, and mechanisms of action of the listed drugs, and how non-steroidal anti-inflammatory drugs relieve pain. However, results also showed that the respondents had good knowledge (mean score of $2.46 \pm 1.03$ out of the maximum of score of 3 allotted) of the conditions in which topical medications are indicated, although they have a poor knowledge of the common adverse reactions of topical medications applicable in physiotherapy (mean score of $1.44 \pm 1.16$ out of the maximum score of 4). A total of 111 respondents (80.7%) could not explain how topical non-steroidal anti-inflammatory drugs relieve pain. The results also showed that there was a significant association between years of clinical experience and scores obtained for knowledge about active ingredients ($\chi^2 = 347.903$, $p < 0.03$). The study concluded that most Nigerian physiotherapists have poor knowledge of...
Introduction

Knowledge is the capacity to acquire, retain, and use information. It is also a mixture of comprehension, experience, discernment, and skill [1]. Physiotherapists often have limited knowledge or inadequate formal training in pharmacotherapy [2]. Physiotherapy is most often used with pharmacotherapy [3]. The recommended treatment for a number of illnesses such as cardiac and pulmonary diseases, diabetes mellitus, Parkinson’s disease, and rheumatoid arthritis involves a combination of pharmacotherapy and physiotherapy [4–6]. Topical pharmacotherapy is one of the key means of treating these conditions, and there may be an interaction between topical pharmacotherapy and physiotherapy intervention.

Legislation supports physiotherapists to recommend that patients seek advice from medical practitioners or pharmacists. It also supports the use of topical pharmacotherapy as an adjunct to electrophysical therapy and manual therapy. Kumar and Grimmer [7] reported that there is a lack of clarity regarding the need for physiotherapists to obtain explicit consent from the patient to use topical pharmacotherapy or to obtain information from the patient regarding the past effects of using topical pharmacotherapy.

Physiotherapists are often involved in direct treatment of open wounds, using topical pharmacotherapy in conjunction with other modalities [8]. They also frequently advise their clients on the use of over-the-counter medications and administer them in the course of treatment [9]. This practice may have a bearing on professional liability if side effects and contraindications are not adequately considered. In addition, some un-prescribed topical pharmacotherapy may have an effect on physical therapy care [9]. There is a need for physiotherapists to have adequate knowledge of topical pharmacotherapy such as non-steroidal anti-inflammatory drugs (NSAIDs), analgesics, and antibiotics, which they use frequently in administering treatment procedures. It is also important for physiotherapists to modify treatment programmes so as to improve the efficacy of drugs and physiotherapy [3]. This is not unconnected with their knowledge [2].

The topical pharmacotherapy delivery system differs from transdermal delivery systems; the target in the former is a site immediately adjacent to the site of delivery rather than using the skin as an alternate systemic delivery system as in the case of the latter. The actions in both systems may be on the inflammatory response itself such as decreasing the production of inflammatory mediators or blocking the action of inflammatory mediators, and they may act on sensory neurons by altering the impulse generation or through actions on specific receptors or the sensory neuron to attenuate the activation of that neuron [10]. There are relatively high concentrations of topical NSAIDs in the dermis, whereas levels in the muscle are at least equivalent to those following systemic administration [11]. The concentration is observed in the synovial fluid, but it is unclear whether this reflects local penetration or results from systemic circulation [12]. Topical capsaicin produces benefits in post-herpetic neuralgia [13,14], diabetic neuropathy [15], post-mastectomy pain syndrome [14,16], oral neuropathic pain, trigeminal neuralgia, and temporomandibular joint disorders [17,18], cluster headache (following intranasal application), and dermatological and cutaneous conditions [19]. It appears that most physiotherapists have little or no knowledge of the pharmacodynamics or pharmacokinetics of these drugs.

Systematic reviews of randomised trials in acute and chronic pain have shown topical analgesics such as methyl salicylate, capsaicin, and NSAIDs to be effective on chronic knee osteoarthritis. To be effective, topical NSAIDs have to penetrate the skin and either enter the circulation or additionally be absorbed into underlying tissues to inhibit cyclo-oxygenase. An in vitro-based index of topical anti-inflammatory activity combines dermal penetration with cyclo-oxygenase inhibitory effect [20].

Topical pharmaco-therapeutic agents have been shown to be effective in the management of open skin wounds. These agents may assist in less-complicated healing and decrease the conversion of a partial thickness injury to a full-thickness injury, and thereby reduce wound-related morbidity [21]. Bacitracin, a soothing ointment, is a relatively inexpensive topical antimicrobial used in cleansing small wounds (less than 10% of the total body surface area) once or twice daily. Bacitracin, however, does not penetrate well and is ineffective against Gram-negative bacteria. This may challenge the physiotherapist’s decision on the choice of bacitracin for treatment of Gram-negative bacteria.

There appears to be a dearth of research on physiotherapists’ knowledge of medications. Most of the related studies emanate from Australia [2]. Also, it appears that little or no related study has been done in Nigeria. The primary objective of this study was to determine the knowledge of Nigerian physiotherapists regarding several topical pharmaco-therapeutic agents. The study was also aimed at testing the association between age, clinical experience, qualification, and work setting, and knowledge of the active ingredients of selected topical medications applicable to physiotherapy.

Methods

Participants and sampling

The participants comprised of 135 practising physiotherapists who were willing to participate in the cross-sectional
survey study. These participants were selected from five federal university teaching hospitals, two state hospitals, one private hospital, two private clinics, and three physiotherapy training schools using convenience sampling. All work settings are in the southwest region of Nigeria. The participants were licensed and practised at the selected settings at the time of data collection. The participants also willingly completed the questionnaire on the spot at an arranged time and returned it immediately without consulting any physiotherapy colleague or person in a related field.

Instrumentation

A self-administered questionnaire was used for this study. The questionnaire is a modified version of the questionnaire used by Grimmer et al [22]. To minimise the effect of the participants' responses due to the variety of their educational backgrounds, the questions were kept as simple as possible, with a Yes or No, and Don’t know response format including free texts and checklists (of correct and incorrect answers). The questions were influenced by some common myths about knowledge, usage, and attitude towards topical pharmacotherapy. The questionnaire was divided into four sections: Demographics, Current knowledge, Current practice, and Attitudes.

A pilot study was conducted before the actual data collection. A draft of the questionnaire was pilot tested in multistage phases. Ten physiotherapists who were not part of the main study were asked to complete the questionnaire. This was to determine whether the questions were clear and appropriate. On the basis of the responses, changes were made to the questions’ layout, content, wording, and intent. The revised questionnaire was returned to these same physiotherapists on three different occasions until there was no ambiguity in the questionnaire.

Research design

This study was designed as a cross-sectional exploratory survey study.

Procedure

The Ethics and Research Committee of the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife, Osun State, Nigeria, granted approval for the study. Permission was sought from the heads of the physiotherapy department of the selected institutions to conduct the study. The aims of the study were explained to the participants, and confidentiality of information was assured. A consent form was signed by all participants ahead of the study. Two hundred copies of the questionnaire were distributed and administered to the participants personally. In order to maintain anonymity, participant’s name was not required in the questionnaire. The questionnaire was completed by the participating physiotherapists when it was convenient for them to do so. The questionnaire was completed on the spot by the participants. This was necessary to prevent the participants from interaction and cheating. The researcher was around to supervise the participants while they were completing the questionnaires. In order to score the participants on knowledge, the answers provided by the participants were marked and graded. Sixteen was the maximum score allotted for knowledge about active ingredients in the checklist of the selected topical medications (Voltaren gel, diclofenac, Feldene gel, piroxicam, Neimeth, Lagos, Nigeria, spray gel, methyl salicylate, Lagos, Nigeria, Neurogesic ointment, methyl salicylate, Drugfield, Lagos, Nigeria, Lofnac cream, Zetgel, methyl salicylate, and Urah (glucosamine sulfate) (Amber Towers, Singapore)).

Before the study, seven physiotherapists with at least 15 years of teaching experience in the physiotherapy department of a Nigerian university were asked to grade and rate the scores ranging from 0 (minimum) to 16 (maximum). The consensus grading was used for rating in this study. The respondents overall scores were graded thus:

- 0–2 Very poor knowledge
- 3–5 Poor knowledge
- 6–8 Fair knowledge
- 9–11 Good knowledge
- 12–14 Very good knowledge
- Above 14 Excellent

On indications for the use of topical medications as applicable to physiotherapy, the maximum mark was 3. Meanwhile, the maximum mark allotted for questions on contraindication and adverse reaction to topical medications was also 3. The maximum mark allotted to questions on dominant charge (ion) of topical medications as applicable to physiotherapy was 4.

Data analysis

Descriptive statistics (frequency, mean, and standard deviation) was used to analyse the data obtained. Pearson chi-square was used to test the association between scores obtained on knowledge of active ingredients of the selected topical medications and age, clinical experience, qualification, and work setting. Data analysis was carried out using statistical package for social sciences software (SPSS Inc., Chicago, IL, USA).

Results

A total of 152 copies of the questionnaire were completed and returned on the spot, representing a response rate of 76%. Of these, only 135 were analysed, representing an overall response rate of 67.5%. Seventeen copies of the questionnaire were invalidated due to the unavailability of basic and vital information that are essential for analyses. The results of this study showed that of the 135 respondents in this study, 70 (51.9%) are males while 65 (48.1%) are females. The educational qualifications attained by the respondents and place of work are presented in Table 1. Fifty-five respondents (40.7%) reported that they recently updated their knowledge on topical medications, while 24 respondents (17.8%) reported that they had never updated their knowledge on topical medications. Fifty-two (40.9%) of the 134 respondents reported that they did not seek
for information to update their knowledge on topical medications applicable to physiotherapy. The results also showed that the most common source (59.3%) used to update knowledge about topical medications is through seminars given by drug companies. (Multiple answers were provided to these questions, as shown by the total number of responses; see Table 2.)

The result of the chi-square test showed that there was a significant difference in the percentage difference in the number of respondents across the categories of degrees of qualifications, years of clinical experience, and work settings ($\chi^2 = 33.2, p < 0.001$, $\chi^2 = 93.9, p < 0.001$, and $\chi^2 = 10.6, p = 0.010$, respectively; Table 1). Similarly, the number of respondents who sought to improve their knowledge was significantly higher than those who did not ($\chi^2 = 4.2, p = 0.040$). However, there was no significant difference in the percentage difference in the number of respondents' current work time and duration of when knowledge was last updated (Table 2). The mean score of respondents with regard to knowledge of the active ingredients in topical medications commonly used in physiotherapy was $5.21 \pm 2.52$ out of a maximum score of 16. Only one participant (0.7%) had a very good knowledge of the active ingredients in topical medications listed in this study, while 57 respondents (42.2%) had poor knowledge (Table 3).

Out of the 146 responses (multiple choices) to the question on risk associated with the use of topical medications as applicable in physiotherapy, 80 respondents (5.9%) indicated rashes, 19 respondents (14.1%) indicated itching, five respondents (3.7%) indicated burns, while other risks were indicated by 28 respondents (20.7%). Eighteen respondents (13.3%) gave incorrect answers, while 68 respondents indicated that there is no risk.

The results of the study showed a significant association between years of clinical experience and scores obtained for knowledge about active ingredients ($\chi^2 = 347.9, p = 0.030$). However, there was no significant association between age, place of work (work setting), and qualification (Table 4).

On the question of whether legislation allows physiotherapists to advise on the use of topical medications as applicable in physiotherapy, 95 respondents (70.4%) indicated “Yes”, eight respondents (5.9%) indicated “No”, while 32 respondents (23.7%) reported “Don’t know”.

### Table 1: Respondents’ demographic profile

| Variable              | Frequency | Percentage | $\chi^2$ | p     |
|-----------------------|-----------|------------|----------|-------|
| Highest qualification |           |            |          |       |
| Bachelor’s degree     | 66        | 49.3       |          |       |
| Master’s degree       | 52        | 38.8       |          |       |
| Doctorate             | 17        | 11.9       | 33.2     | <0.001|
| Experience            |           |            |          |       |
| 1–5 y                 | 46        | 34.1       |          |       |
| 6–11 y                | 44        | 32.5       |          |       |
| 12–17 y               | 23        | 17.1       |          |       |
| 18–23 y               | 18        | 13.3       |          |       |
| 24–29 y               | 4         | 3.0        | 93.9     | <0.001|
| Work place            |           |            |          |       |
| Private hospital      | 16        | 11.9       |          |       |
| State hospital        | 6         | 4.4        |          |       |
| Teaching hospital     | 70        | 51.9       |          |       |
| Academic setting      | 17        | 12.6       |          |       |
| Any three of the above| 5        | 3.7        |          |       |
| Others                | 21        | 15.6       | 10.6     | 0.010 |

### Table 2: Current work schedules, update of knowledge, source of information

| Variable               | Frequency | Percentage | $\chi^2$ | p     |
|------------------------|-----------|------------|----------|-------|
| Current work time      |           |            |          |       |
| In-patients            | 49        | 36.3       |          |       |
| Private practice       | 23        | 17.0       |          |       |
| Out-patients           | 37        | 27.4       |          |       |
| Community setting      | 4         | 3.0        |          |       |
| Others                 | 22        | 16.3       | 4.1      | 0.260 |
| Update of knowledge    |           |            |          |       |
| Never                  | 24        | 17.8       |          |       |
| Recently               | 55        | 40.7       |          |       |
| <1 y                   | 25        | 16.3       |          |       |
| 1–5 y                  | 16        | 11.85      |          |       |
| 5–10 y                 | 11        | 8.15       |          |       |
| >10 y ago              | 4         | 3.0        | 2.3      | 0.500 |
| Information seeking    |           |            |          |       |
| Yes                    | 75        | 59.1       |          |       |
| No                     | 52        | 40.9       |          |       |
| Source of information  | (multiple choice) |    |          |       |
| Drug companies         | 80        | 59.3       |          |       |
| Journal articles       | 49        | 36.3       |          |       |
| Advertising            | 36        | 26.7       |          |       |
| Via another physiotherapist | 30    | 22.2 |          |       |
| Training schools       | 20        | 14.8       |          |       |
| Local pharmacist       | 19        | 14.1       |          |       |
| Via EMDEX              | 18        | 13.3       |          |       |
| General medical practitioners | 15 | 11.1 |          |       |
| Others                 | 8         | 5.9        |          |       |
| Via NSP                | 5         | 3.7        |          |       |
| Via MRTB seminars      | 2         | 1.5        |          |       |

EMDEX = Electric and Magnetic Field Digital Exposure System; MRTB = Medical Rehabilitation Therapists Registration Board of Nigeria; NSP = Nigeria Society of Nigeria.

### Table 3: Frequency distribution of knowledge on active ingredients in topical medications

| Range of score | Grading       | Frequency (n = 135) | Percent |
|---------------|---------------|---------------------|---------|
| 0–2           | Very poor knowledge | 18             | 13.5    |
| 3–5           | Poor knowledge     | 57             | 42.2    |
| 6–8           | Fair knowledge     | 48             | 35.5    |
| 9–11          | Good Knowledge     | 11             | 8.1     |
| 12–14         | Very good knowledge| 1              | 0.7     |
| 14 and above  | Excellent         | 0              | 0       |
the 135 total respondents were asked whether legislation allows physiotherapists to prescribe topical medications as applicable to physiotherapy, 105 respondents (77.8%) indicated “Yes”, seven respondents (5.2%) indicated “No”, while 23 (17.0%) indicated “Don’t know”. Other results on permission to recommend, supply, and use topical medication as applicable to physiotherapy are presented in Table 5.

When respondents were asked to list three conditions for which topical medications are used as applicable to physiotherapy, the result showed that the respondents had a mean score of 2.46 ± 1.03 out of the maximum score of 3. When asked to list three conditions for which topical medications are contraindicated as applicable to physiotherapy, the results revealed that the respondents had a mean score of 1.28 ± 1.13 out of the maximum score of 3. On common adverse reactions of topical medications applicable in physiotherapy, the mean score was 1.44 ± 1.16 out of the maximum score of 4.

Respondents were asked to state how topical NSAIDs relieve pain. Out of 134 respondents, 18 respondents (13.4%) indicated that they inhibit the production of cyclo-oxygenase, three respondents (2.2%) indicated that they deactivate nociceptive nerves through cooling, two respondents (1.5%) gave relevant mode of actions, while the other 111 respondents (80.7%) gave incorrect answers.

Regarding the knowledge of respondents about topical antibiotic drugs that are applicable in wound management as related to physiotherapy, the results showed that for Gentamicin ointment, 83 respondents (61.5%) reported that they do not know if it is applicable; this is similarly reflected in the other listed topical antibiotics (Table 6).

Respondents were asked to provide in free text what they understood by iontophoresis. Out of 135 respondents, 74 respondents (55.6%) answered correctly, while 59 respondents (44.4%) answered incorrectly. Similarly, when respondents were asked what they understood by phonophoresis, 70 respondents (57.8%) answered correctly while 63 respondents (46.7%) answered incorrectly. To corroborate the questions on iontophoresis, respondents were asked to identify the dominant ions present in some selected topical medications as applicable to physiotherapy. The results showed that the mean score on knowledge was 0.60 ± 1.30 out of the maximum score of 4. This showed that most of the respondents have a very poor knowledge of the mechanism of iontophoresis.

**Discussion**

This study showed that a significant percentage of the respondents have a basic first degree qualification and a few years of clinical experience ranging between 1 and 11 years, and these may be contributory factors to the poor level of knowledge observed in this study. Contrarily, a significant percentage reported that they sought for knowledge on pharmacotherapy while a significant number of respondents were working in a university teaching hospital; if so, this was not a true reflection of the poor level of knowledge observed about active ingredients, adverse reactions, contraindications, risks, mechanism of action of how NSAIDs relieve pain, and dominant ions of topical drugs used for iontophoresis. However, most respondents actively sought for information to update their knowledge from seminars offered by drug companies and from journal articles, although they also noted that in the past 6 months they mostly used instructions from medication packets. This varied from previous findings in Australia, where physiotherapists mostly updated their knowledge between 1 and 5 years, and their most common source of information was the *Monthly Index of Medical Specialties* and medical practitioners [9,22].

| Table 4 | Association of knowledge about active ingredients with age, years of clinical experience, qualifications and work setting |
|---------|-------------------------------------------------------------------------------------------------------------------------|
| Variables | $\chi^2$ | Degree of freedom | $p$ |
| Age | 40.6 | 36 | 0.070 |
| Years of clinical experience | 347.9 | 348 | 0.030 |
| Qualifications | 4.0 | 3 | 0.490 |
| Places of work (work setting) | 75.6 | 60 | 0.140 |

| Table 5 | Advise, prescription, and use of topical medications |
|---------|-----------------------------------------------------|
| Variable | Yes | % | No | % | Don’t know | % |
| Advise on the use of topical medications | 95 | 70.4 | 8 | 5.9 | 32 | 23.7 |
| Prescription of topical medications | 101 | 77.8 | 7 | 5.2 | 2 | 17.0 |
| Recommend topical medications | 109 | 80.7 | 5 | 3.7 | 21 | 15.6 |
| Supply topical medications | 30 | 22.2 | 8 | 5.9 | 32 | 23.7 |
| Use topical medications | 113 | 83.7 | 3 | 2.1 | 19 | 14.1 |

$n =$ frequency, $\% =$ percentage.
This study suggests that there is need for continuing professional development seminars on the quality use of topical medicines. Academic curriculum should also be reviewed to include topical pharmacotherapy for undergraduate physiotherapy students. The results of this study showed that the overall mean score of the sampled physiotherapists reflects that they have a poor knowledge of the active ingredients in topical medications which they frequently use. Majority of the respondents opined that there was no risk associated with the use of topical medications in physiotherapy practice. This supports the previous findings that physiotherapists lack knowledge on topical medications, which have similar risks as oral medications [9]. This is corroborated by the findings that the use of topical methyl salicylate ointments in cardiac disease patients receiving anticoagulation therapy could portend: a risk of bleeding manifestation, bruises in the skin, and gastrointestinal bleeding [23].

This study further revealed that respondents have a very low mean score in knowledge on contraindication of the selected topical medications listed in the study. Survey studies emanating from Australia showed that many physiotherapists reported inadequate training on medications [2]. These accounted for some lax practices such as failing to keep comprehensive records or making only occasional inquiries about medications. Grimmer et al [22], in a similar study, reported that few physiotherapists responded to questions regarding the side effects of topical NSAIDs. Yip et al [24] observed that topical methyl salicylate caused local irritation, dermatitis, local burn injuries, skin redness, and various degrees of pain after about an hour of application. They advised that people be aware of its potential risk. The adverse effect of topical capsaicin is burning pain at the site of application. Topical lidocaine as a 5% gel or patch [25,26] provides effective pain relief in post-herpetic neuralgia with no systemic adverse effects. This study showed that most respondents do not understand how NSAIDs relieve pain. This supports the findings of Grimmer et al [22], who reported that majority of Australian physiotherapists believed that topical NSAIDs are placebos, and hence do not understand the mechanism of action of the topical medications they use. This further supports the findings of Lansbury and Sullivan [9], who raised concerns about physiotherapists advising and administering medications (especially topical medications—over the counter) to their clients despite having limited knowledge about the appropriateness, side effects, and contraindications of specific medications they use in clinical practice.

This study found no association between knowledge of active ingredients in topical medications and age, academic qualifications, and clinical settings. The common clinical settings where Nigerian physiotherapists practice are university teaching hospitals, state hospitals, academic setting, private clinics, and sports medicine centres. The university teaching hospital appears to have the highest standards in terms of quality personnel, equipment, and facilities. The pay or financial remuneration received by physiotherapists who work there is also higher compared to that earned by their counterparts in other settings, except in the case of a few physiotherapists in sports medicine centres who earn extra allowances from sports trips. However, there was a significant association between years of clinical experience and knowledge. This tends to confirm the usual assumption that clinicians with more experience in general have accumulated knowledge and skills during years in practice and therefore may be able to deliver high-quality care. However, among physicians, evidence suggests that there is an inverse relationship between the number of years that a physician has been in practice and the quality of care that he provides [27].

Overall, the results of this study revealed that a large number of physiotherapists have knowledge of conditions in which topical medications are indicated. This falls in line with the results of a previous study [22]. In addition, the high percentage of “Don’t know” and incorrect responses on legislation, advise, prescription, recommendation, supply, and use of topical medications indicated that there is need for more education for physiotherapists because it is their responsibility to have knowledge of what they recommend and prescribe in clinical practice.

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