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*Original Research Article*

# EFFECTS OF SCULPTURAL CONFIGURATION OF TABLETS ON CONSUMERS' ACCEPTABILITY OF ANTIHYPERTENSIVE MEDICINES IN A TERTIARY HEALTH INSTITUTION

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## ABSTRACT

Acceptability of antihypertensive medicines will prevent disease progression and improve adherence and treatment outcome among hypertensive patients. Sculptural design (colours, shapes, sizes) has affected most of the works of humanity including the design of pharmaceutical dosage forms especially tablets. The sculptural designs and packaging of antihypertensive tablets may affect patient acceptability. The study assessed the effects of sculptural configuration of tablets on consumer's acceptability of antihypertensive medicines in a tertiary hospital in Southeast Nigeria. The study was a cross-sectional survey of hypertensive patients receiving medication under the National Health Insurance Scheme (NHIS) from the Pharmacy Unit of the Federal Medical Centre, Umuahia between April to August 2021. A self-administered questionnaire was used to collect data on demographics, preferences of tablet's shapes and sizes, as well as other preferred dosage form for antihypertensive medicines. The data were analyzed with descriptive statistics using IBM SPSS version 23. Data for 285 patients were analysed, and most of them were males 200 (70.2%) and have tertiary education 190 (66.7%). Small sized (8.05 mm) tablets were mostly preferred by 209 (73.3%) of the patients. More than half (171 (60%)) of the respondents felt small sized tablet will produce the best antihypertensive effect while 19 (6.7%) of them choose large sized tablets for best antihypertensive effects. Round shaped tablets were the most preferred first option 190 (66.7%) for the patients and 133(46.7%) choose only round tablet as the shape of preferred antihypertensive medicine. A higher proportion 190 (66.7%) choose capsule as another preferred dosage form. The most preferred tablet configuration among the respondents was small sized and round shaped tablets. Capsules are also acceptable dosage form for patients of antihypertensive drugs. The sculptural design for antihypertensive tablet should encompass round shaped small sized tablets.

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## INTRODUCTION

Medicines play essential role in the management of hypertension and prevention of progression to other serious complications [1]. Antihypertensive medicines are formulated in tablet, the widely manufactured and prescribed medicine dosage forms [2]. The formulation of antihypertensive medicine can only be completed with the prove that the medicine will be taken by a patient as intended [3]. This is

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pertinent as antihypertensive medicine are to be taken daily for patients to experience the beneficial effects. The visual appeal (colour, shape and size) of the tablet may affect the acceptability of these medicines by the patient, which is paramount to adherence and treatment [4,5]. Acceptability in this regard is defined as the ability and willingness of the end-user to take the drug product as intended [6].

Sculptural design (shape, size) has affected most of the works of humanity, including medicine designs [7]; it therefore behoves drug manufacturers to consider the aesthetic values comprising: tactile quality, elegance and visual appeal while formulating medicines. The tactile quality comprises the texture (smooth or rough), soft or hard, which determines how patients handle the tablets. Elegance is the outward appearance, which depends largely on the general artistic design and the sculptural configuration, like the sizes and shapes employed in the manufacturing of the tablet. Visual appeal comprises colour, shape and size; these determine how patients visually perceive the tablets, which influences adherence [8,9]. Recognizing individual preferences and aesthetic needs of the patient may increase acceptability, adherence, and patient confidence in the physician, which ultimately improves treatment outcome [5,9,10]. Patient expectation in drug design has been addressed through patient-centric formulation, which involves modifying the physical appearance of medicines to accommodate individual aesthetic preferences, personalizing the shape and size of dosage forms to align with patient-specific needs [11]. It has been documented that the size and shape of tablets and capsules affect the preference, handling, ease of swallowing, and oesophageal transit in adults [9,12], medicinal strength and efficacy [13], evoking body sensations and triggering energizing or calming effect [14].

Sculptural configurations of tablets determine how patients psychologically perceive these tablets. These psychological perceptions may also affect how easily a patient accepts or rejects the use of the tablet [5]. Unacceptability of pharmaceutical dosage forms supports noncompliance, abandonment and unlicensed use of medicines since patients will resort to self-medication that usually result to toxicity [15]. The abandonment of antihypertensive tablets heralds the progression of hypertension to cardiovascular, cerebral diseases and chronic kidney disease [1].

However, information on the acceptability of tablets due to the instrumentality of aesthetic values, artistic designs, and sculptural configurations among hypertensive patients is scarce. Studies on antihypertensive tablets have focused on the prescription pattern of drugs [16,17], while other studies have assessed the availability of antihypertensive drugs in different health facilities [18,19]. There have been investigations into adherence to antihypertensive medicines [20,21]. To facilitate drug administration and overcome medication challenges of hypertensive patients, their needs and preferences should be considered in the drug product design. Therefore, this study assessed the effects of sculptural configurational designs of tablets on consumers' acceptability of antihypertensive medicines in Abia State, Southeast Nigeria.

## MATERIALS AND METHODS

### Study design and setting

The study was a cross-sectional survey conducted at the Federal Medical Centre (FMC), Umuahia, among hypertensive patients between April to August 2021. The centre is the only tertiary hospital located in the capital city of Abia state and enjoys a large patronage of patients

### Population and sample

The population for the study consists of all hypertensive patients attending cardiovascular and family medicine clinics in the Federal Medical Centre (FMC), Umuahia. Based on the data collected on the number of patients consulted for hypertension monthly, a sample size of 286 patients was calculated using sample size calculation tables at a 95% confidence level and a precision level of ±5. A convenient sampling method was used to select participants who has been taking their medications for at least three months and picked up their prescriptions from the hospital's National Health Insurance Pharmacy section. The study excluded patients who were not cooperating and elderly people without informed caregivers.

### Study instrument

The study instrument was a 23-item self-administered questionnaire developed after reviewing various questionnaires [5,12] that have been used in assessing the acceptability of oral solid dosage forms. Experts in questionnaire design analyzed the survey questions and made necessary modifications. To test the comprehension and wording of the questions, a pilot study consisting of 20 hypertensive patients who were collecting medication in the Federal Medical Centre, Umuahia's General Outpatient Department pharmacy unit. Corrections were made to the questionnaire before administering to the participants. There were six sections in the questionnaire that explored information on demographics, preferences of colour, size, shape, packaging, and the acceptability of alternative tablet designs. In this paper, we discuss the data on the acceptability of sizes, shapes, and alternative dosage forms.

### Data collection and analysis

A structured self-administered questionnaire was used to collect data on the preferences of sizes and shapes of tablets from hypertensive patients collecting medicines from the National Health Insurance Pharmacy unit of the hospital. The acceptability of sizes was investigated with a picture (Figure 1) of three different sizes of tablets of the same shape and colour. The picture was given to each respondent, from whom they answered questions on their most preferred size, the size they would prefer to swallow, and the least preferred size. They were asked to choose the size they think will produce the most antihypertensive effect and the least

antihypertensive effect. The three tablets had different diameters of 8.05, 9.85 and 11.95 mm, denoted as small, medium, and large sizes, respectively [22].

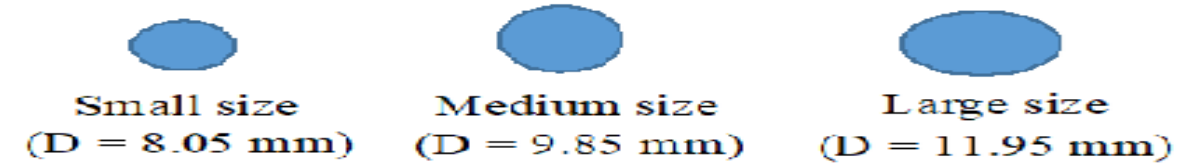


**Figure 1: Sizes of tablets used in the study**


**Figure 2: Shapes of tablets used in the study**

**Table 1: Demographic data of respondents**

| Demographic variables | Frequency | % |
|---|---|---|
| **Gender** | | |
| Females | 85 | 29.8 |
| Males | 200 | 70.2 |
| **Age of the respondents** | | |
| ≤ 40 | 76 | 26.7 |
| 41-59 | 152 | 53.3 |
| ≥ 60 | 57 | 20 |
| **Highest educational qualification** | | |
| ≤ Primary school | 19 | 6.7 |
| Secondary | 38 | 13.3 |
| Tertiary | 190 | 66.7 |
| Higher degree | 38 | 13.3 |
| **Monthly income** | | |
| ≤ 100,000 | 57 | 20 |
| 101,000-200,000 | 76 | 26.7 |
| 201,000-300,000 | 95 | 33.3 |
| >300,000 | 57 | 20 |
| **Health status** | | |
| Excellent | 38 | 13.3 |
| Very good | 57 | 20 |
| Good | 95 | 33.3 |
| Fair | 95 | 33.3 |
| Poor | | |
| **The average number of tablets swallowed daily** | | |
| 1-2 | 38 | 13.3 |
| 3-4 | 114 | 40 |
| 5-6 | 76 | 26.7 |
| > 6 | 57 | 20 |

**Table 2: Respondents' antihypertensive tablet size preference.**

| Acceptability of sizes | Frequency | % |
|---|---|---|
| **Size of tablet respondents most preferred to swallow** | | |
| Small | 209 | 73.3 |
| Medium | 76 | 26.7 |
| Large | 0 | 0 |
| Total | 285 | 100 |
| **Least preferred size of tablet** | | |
| Small | 38 | 13.3 |
| Medium | 76 | 26.7 |
| Large | 171 | 60 |
| Total | 285 | 100 |
| **The size that will produce the best antihypertensive effect** | | |
| Small | 171 | 60 |
| Medium | 95 | 33.3 |
| Large | 19 | 6.7 |
| Total | 285 | 100 |
| **Size of the tablet with the least antihypertensive effect** | | |
| Small | 76 | 26.7 |
| Medium | 57 | 20 |
| Large | 152 | 53.3 |
| Total | 285 | 100 |

**Table 3: Shapes of tablets preferred by consumers of antihypertensive drugs**

| Acceptability of tablet shapes | Frequency | % |
|---|---|---|
| **The shape of tablet the respondents most preferred to swallow** | | |
| Round | 190 | 66.7 |
| Oval | 19 | 6.7 |
| Triangle | 38 | 13.3 |
| Oblong | 38 | 13.3 |
| Heart | 0 | 0 |
| Total | 285 | 100 |
| **Second most preferred tablet shape** | | |
| Round | 133 | 46.7 |
| Oval | 95 | 33.3 |
| Triangle | 0 | 0 |
| Oblong | 0 | 0 |
| Heart | 57 | 20 |
| Total | 285 | 100 |
| **Least preferred tablet shape** | | |
| Round | 38 | 13.3 |
| Oval | 0 | 0 |
| Triangle | 133 | 46.7 |
| Oblong | 95 | 33.3 |
| Heart | 19 | 6.7 |
| Total | 285 | 100 |

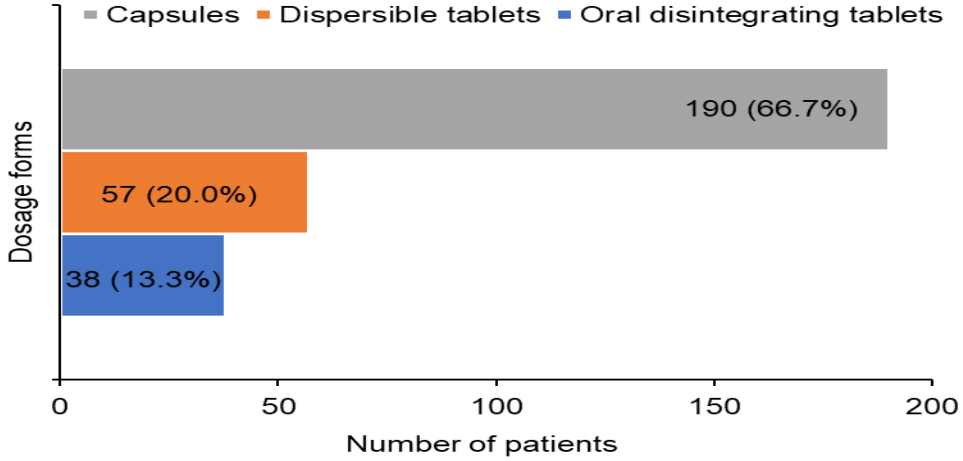


**Figure 3**: **Acceptability of other solid dosage forms by the consumers of antihypertensive tablets.**

To assess their acceptability for shapes of the tablet, five drawings (Figure 2) of tablets with the same size but various shapes were presented to the patients. They were asked to choose the shape of the tablet which appeals to them most and which they will prefer most to swallow, the second preferred shape, and the least preferred shape.

To enhance the study's robustness, inquiries were posed regarding alternative oral solid dosage forms that the patient may prefer. A capsule, granules in the sachet, effervescent tablet, orally disintegrating tablet, and chewable tablet were presented to the patient. The method of administration was explained to the patient, and they were asked to choose their preferred oral solid dosage form. The questionnaire was filled out and returned on the spot. The participants signed a consent form before participating in the study.

All collected data were analyzed with descriptive statistics using IBM Statistical Package for Service Solution version 23[23].

**Ethical Clearance**

An informed oral consent was obtained from the participants after explaining the purpose, procedures, risks and benefits of the study, also their right not to participate or withdraw from the study at any time.

## RESULTS

**Demographic variables**

Table 1 details the demographic variables of the respondents. A total of two hundred and eighty-five (285), a 99.6% of the questionnaires, were valid and analyzed. Approximately three-quarters of the respondents were males (n = 200, 70.2%). More than half (n = 152, 53.3%) of the patients were between 41 and 50 years of age. A little more than a quarter (n = 95, 33%) earned between ₦201,000 to ₦300,000 in a month. An equal proportion (n = 95, 33.3%) rated their health status as good or fair.

Most respondents, 209 (73.3%), preferred to swallow the small-sized tablet, while the remaining chose the medium-sized and none chose the large-sized tablet for swallowing. Most consumers preferred antihypertensive medicines in the form of capsules, 190 (66.7%). A smaller proportion, 38 (13.3%) accepts dispersible tablets, while none choose granules in sachets and chewable tablets (Figure 3). The reason for choosing each of the dosage forms was the same, as all respondents said their choice was easier to swallow.

Large-sized tablets were the least preferred, 171 (60%). More than half 171 (60%) of the respondents felt small-sized tablets would produce the best antihypertensive effect (Table 2).

Considering the shapes of the tablets, the round-shaped tablet 190 (66.7%) was the most preferred shape of tablet for antihypertensive medicine consumers and 133 (46.7%) patients chose only round shaped tablet as their preferred shape of antihypertensive medicine. A heart-shaped tablet was not chosen as the first preferred tablet, but was the second option for one-fifth, 57 (20%) of the respondents. The least preferred shape of tablet was triangular-shaped, 133 (46.7%) (Table 3).

## DISCUSSION

Adherence to daily medication is known to be challenging universally especially in chronic conditions like hypertension. Evaluation on patients' preferences and acceptability of antihypertensive medicines are rare. The study investigated the effects of the sculptural configuration (sizes and shapes) of tablets on consumers' acceptability of antihypertensive medicines in Federal Medical Centre Umuahia, Abia State, Southern, Nigeria.

The proportion of male respondents (70.2%) were higher than in other reports of hypertension cohorts in Nigeria (41.2%) [16], and (44.8%) [17]. This might be attributed to the higher utilization of drugs by the male gender under the National Health Insurance Scheme [24].

Small-sized tablets were accepted by most of the respondents, which is similar to other studies [8,9]. The best antihypertensive effects were attributed to the small-sized tablet also. This may be due to easy transit attributed to small-sized tablets along the esophagus [5].

The first and second most preferred shape of antihypertensive tablets in FMC Umuahia was round, while the oval shape was not taken as a first choice but was chosen by more consumers as a second option. This contradicts a Malaysian report [12] of oval shape as the first choice, while the circular shape was the second. The difference is that our study investigated consumers of the same African descent. Again, our study looked at only tablets as against other solid dosage forms. This might also imply that round and oval shapes are acceptable shapes for oral dosage forms among different patients.

Consumers preferred antihypertensive drugs to be capsules, which contradicts orally disintegrating tablets [25]. In contrast, the preference for capsules in our study corresponds to a Malaysian study [12]. The difference may be attributed to the older ages of the respondents included in our study as acceptability is affected by patients' characteristics, including age. Patients had a low preference for granules in a sachet, which is similar to a report among gastroenteritis patients who rejected granules [10]. The study reported no reason for rejection of granules except that patients preferred tablets. This might imply that disease conditions may play a role in the nature of the solid dosage form accepted by patients. However, the reason for choosing the capsule as an alternative dosage form may be attributed to the long use, which has increased awareness and familiarity over the decades [26].

A limitation to our study is the non-generalizability to other patients in Nigeria. Also, we focused only on the NHIS patient whose perception may differ to an extent from the other patients. Notwithstanding the limitations, it is the first study to investigate the acceptability of antihypertensive tablets based on shapes, sizes and general aesthetic perception of the patients.

## CONCLUSION

The preferred sculptural configurations for antihypertensive medicines are small-sized and round-shaped tablets. Capsules are an acceptable dosage form for hypertensive patients in Abia State. These sculptural designs will increase consumers' acceptability of antihypertensive tablets.

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## AUTHORS' CONTRIBUTION

NG Osuafor collected data and wrote the manuscript, CC Akabuike conceptualized the research, and SO Eraga analyzed data and revised the manuscript.

## CONFLICT OF INTEREST

Authors declare no conflict of interest.

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