# *Original Research Article*

**Body Mass Index (BMI) and Cutaneous Lesions among the Elderly Patients in a Tertiary Hospital in Rivers State, Nigeria**


## Abstract

**Aims:** The aim of the study is to highlight that cutaneous lesion can be markers of nutritional status in the elderly.

**Study design:** This is a cross-sectional descriptive study

**Place and Duration of Study:** This study took place within the wards of University of Port Harcourt Teaching Hospital over a 3 months period.

**Methodology:** A sample of 126 elderly patients were calculated as the sample size to be assessed for cutaneous lesions, of which 122 were fit enough to have their BMI assessed using standardized protocol of measuring height and weight. The BMI was calculated using the formula -BMI = $kg/m^2$.

**Results:** Out of the total, 55 of them representing 45.1% had normal BMI, 13 representing 10.7% were underweight, 33 (27%) over weight and 21(17.2%) obese. Underweight elderly patients were more likely than those with normal weight to have xerosis, itching, wrinkles, idiopathic guttate hypomelanosis and ulcers. The elderly with overweight and obesity were more likely to have dermatosis papulosa nigra, signs of post-bleaching syndrome and surgical scars.

**Conclusion:** Complaints or observance of cutaneous lesions in elderly should be a reason to investigate nutrition and the solution may lie in nutrition based treatment. More research is however needed to further evaluate the association between cutaneous lesions and body mass index.



**Key words:** BMI, Cutaneous, Elderly, Lesions, Nutrition,


## Introduction

The proportion of the world's population that is elderly is expected to increase as life expectancy improves making their health needs significant.[1] In 2019 there were estimated to be 703million elderly in the world. The number of elderly people in Sub-Saharan Africa was estimated to be 46

million in 2015 and is expected to grow till 157million in 2050. In Nigeria the proportion of those aged sixty years or older is estimated to be 1-9%.[1]

Nutrition is a key factor in the ageing process and a significant part of future health, helping to maintain good health and reduce risk of disease. Eating a healthy adequate diet contributes to healthy ageing.[1, 2] Physiological changes in elderly people like sensory impairment, poor oral health and dental problems as well as impaired gastrointestinal absorption can negatively impair their nutrition. The progressive loss of vision as well as osteoarthritis can affect elderly nutrition by limiting their ability to shop for food and prepare meals. In addition to these physiological changes ageing may be associated with profound psychosocial and environmental changes which may also have significant impacts on diet.[1] In Africa, while the bulk of nutrition problems are due to dietary inadequacies, increasingly problems of over nutrition associated with nutrition transition are seen in some segments of the population.[3]

Elderly people are prone to cutaneous lesions for several reasons. With ageing the skin suffers progressive decrements that results from physiological mechanisms, genetic predispositions or external insults like sun exposure. Changes with age can make older adults susceptible to dermatitis, pressure ulcer, skin tears and other skin issues. Skin conditions can affect individuals' emotional health that may lead to changes in the way they are perceived by others and may cause withdrawal from social activity.[1]

Nutritional problems are increasingly taking center stage in health and this is not less likely in elderly people. Recent estimates suggest that about 1.9 billion adults worldwide are overweight while 650million are obese. The prevalence of obesity in the elderly has continued to increase. Reports from North America and Europe suggest that approximately 38% of elderly males are overweight while 39% of females are overweight. This indicates that over nutrition which is a form of malnutrition should be paid attention to in elderly populations.

Evidence suggests that Body Mass Index (BMI) is associated with cutaneous lesions. Obesity increases the risks associated with dermatological conditions. One of the reasons for this is likely due to the fact that adipose tissue synthesizes testosterone that can lead to occurrence of hirsutism, alopecia and acne in obese people. Increased skin folds as found in people with larger adipose tissue means increased skin friction, and excessive moisture which can lead to increased likelihood of injury. Wound healing is also delayed in obese people due to decreased blood supply to adipose tissue. [4]

For undernourished people with lower BMI cutaneous lesions may be the first manifestations of the underlying nutritional deficiency and while protein energy malnutrition may be generally uncommon in adults, the elderly are vulnerable to under nutrition. Globally, 3-7.8% of elderly people suffer from undernutrition and in some parts of Africa the proportion is about 15.5%[4]

Among obese people skin tag (acrochorndons), straie distensia, plantar hyperkeratosis, candida intertrigo, acanthosis nigricans, and cellulitis have been suggested to more likely occur. On the

other hand xeroderma, atrophy, oedema, fissures, dyspigmentation have been found occurring more in the undernourished.[4, 5]

Issues associated with nutrition in the elderly are often neglected because they are considered a fate of aging. Having a cutaneous lesion in the elderly affects their health and quality of life as it has been concluded by various studies that even the smallest localized skin lesion can have a poor effect on the affected.[6] Despite the fact that such lesions may be common in the elderly as it has been suggested that more half of elderly patients on admission in hospitals have cutaneous lesions.[7] It thus is important to explore how risk factors such as malnutrition in both spectrums affect it. This will help to improve preventive and management strategies as well as streamline resources. While there are several studies on the elderly, few have focused on the relationship between nutritional and dermatological lesions in the elderly.

## METHODOLOGY

### Study Area

The study was carried out in University of Port Harcourt Teaching Hospital (UPTH). The hospital is a 700-bed tertiary hospital located in Port Harcourt, Rivers state, Nigeria. The hospital plays host to a variety of medical specialists and serves as a referral center for other health care facilities in the state and neighbouring states as well.

### Study Population

The study population included individuals aged 60 years and above presenting to UPTH for medical attention and were admitted to the wards after presentation.

### Sample and Sampling

A purposive cross-sectional sampling of 126 elderly patients that were admitted to the different wards of the hospital within a 3-month period was carried out, however 122 persons were fit enough to have their weight and height assessed using standardized protocol of measuring height and weight. The BMI was calculated using the formula -BMI = $kg/m^2$ where kg is a person's weight in kilograms and $m^2$ is their height in meters squared.

### Data Collection

A PROFORMA data collection sheet was used to collate demographic information, dermatological conditions, weight and height. The weight was measured using a Hanson weighing scale placed on a flat surface and with the pointer at zero mark. The participants wearing light clothing and without footwear, were asked to step on the scale and stand with their feet firmly on the scale without moving. Their weight was then recorded to the nearest 0.1kg. A portable, collapsible stadiometer (Leicester , Height Measure-Seca, Ltd Birmingham, UK) placed

on a firm level surface was used for height measurement according to the standardized protocol. The measurement read by the examiner to the nearest 0.1cm. Body mass index (BMI) was calculated as Weight (Kg)/ Height ($m^2$). The WHO classification was used as follows: underweight- BMI< 18.5kg/m2; normal weight- BMI of 18.5-24.9kg/m2; overweight- BMI of 25-29.9kg/m2 and obesity ≥ 30kg/$m^2$.

**Data Analysis**

The data collected was analysed using the SPSS v25 software at a 95% confidence interval and a p-value less than 0.05 was considered significant. The demographic characteristics and dermatological distributions were presented using frequencies and percentages. The association of BMI and cutaneous lesions was assessed using the Chi-square statistics.

## RESULTS

Results from a total of 122 subjects were obtained regarding their BMI and cutaneous lesions. Out of the total, 55 of them representing 45.1% had normal BMI, 13 representing 10.7% were underweight, 33 (27%) over weight and 21(17.2%) obese. See table 1

Underweight elderly patients were more likely than those with normal weight to have xerosis, itching, wrinkles, idiopathic guttate hypomelanosis(IGH) and ulcers. The elderly with overweight and obesity were more likely to have dermatosis papulosa nigra (DPN), signs of post-bleaching syndrome and surgical scars. See table 2

**Table 1: NUTRITIONAL STATUS OF ELDERLY (BMI)**

| BMI | ALL N (%) | MALE N (%) | FEMALE N (%) |
|---|---|---|---|
| NORMAL | 55 (45.1) | 38 (54.3) | 17 (32.7) |
| UNDERWEIGHT | 13 (10.7) | 4 (5.7) | 9 (17.3) |
| OVERWEIGHT | 33 (27.0) | 15 (21.4) | 18 (34.6) |
| OBESE | 21 (17.2) | 13 (18.6) | 8 (15.4) |
| TOTAL | 122(100) | 70(100) | 52(100) |

**Table 2: ASSOCIATION BETWEEN NUTRITIONAL STATUS AND CUTANEOUS CHANGES**

| Dermatological lesions | Normal | Underweight | Overweight | Obese | p- |
|---|---|---|---|---|---|

| | | | | | value |
|---|---|---|---|---|---|
| **Xerosis** | | | | | **0.170** |
| NO | **31 (56.4)** | **5 (38.5)** | **24 (72.7)** | **12 (57.1)** | |
| YES | **24 (43.7)** | **8 (61.5)** | **9 (27.3)** | **9 (42.9)** | |
| **Rash** | | | | | **0.880** |
| NO | **49 (89.1)** | **11 (84.6)** | **28 (84.8)** | **18 (85.7)** | |
| YES | **6 (10.9)** | **2 (15.4)** | **5 (15.2)** | **3 (14.3)** | |
| **Itching** | | | | | **0.812** |
| NO | **43 (78.2)** | **9 (69.2)** | **27 (81.8)** | **17 (81.0)** | |
| YES | **12 (21.8)** | **4 (30.8)** | **6 (18.2)** | **4 (19.0)** | |
| **Xanthomas** | | | | | **1.000** |
| NO | **54 (98.2)** | **13 (100.0)** | **33 (100.0)** | **21(100.0)** | |
| YES | **1 (1.8)** | **0 (0.0)** | **0 (0.0)** | **0 (0.0)** | |
| **Nevi** | | | | | **0.751** |
| NO | **28 (50.9)** | **6 (46.2)** | **17 (51.5)** | **14 (66.7)** | |
| YES | **27 (49.1)** | **7 (53.8)** | **16 (48.5)** | **7 (33.3)** | |
| **Seborrhoeic Keratosis** | | | | | **0.397** |
| NO | **50 (90.9)** | **11 (84.6)** | **31 ((3.9)** | **17 (81.0)** | |
| YES | **5 (9.1)** | **2 (15.4)** | **2 (6.1)** | **4 (19.0)** | |
| **Dermatosis Papulosa Nigra** | | | | | **0.210** |
| NO | **30 (54.5)** | **5 (38.5)** | **16 (48.5)** | **6 (28.6)** | |
| YES | **25 (45.5)** | **8 (61.5)** | **17 (51.5)** | **15 (71.4)** | |
| **Wrinkles** | | | | | **0.362** |
| NO | **31 (56.4)** | **4 (30.8)** | **19 (57.6)** | **12 (57.1)** | |
| YES | **24 (43.6)** | **9 (69.2)** | **14 (42.4)** | **9 (42.9)** | |
| **Melasma/Hyperpigmentation** | | | | | **0.172** |
| NO | **37 (67.3)** | **9 (69.2)** | **22 (66.7)** | **19 (90.5)** | |
| YES | **18 (32.7)** | **4 (30.8)** | **11 (33.3)** | **2 (9.5)** | |
| **Idiopathic guttate hypomelanosis** | **22 (40.0)** | **5 (38.5)** | **15 (45.5)** | **9 (42.9)** | **0.956** |
| NO | **33 (60.0)** | **8 (61.5)** | **18 (54.5)** | **12 (57.1)** | |
| YES | | | | | |
| **Actinic keratosis** | | | | | **0.549** |
| NO | **55(100.0)** | **13 (100.0)** | **32 (97.0)** | **21(100.0)** | |
| YES | **0 (0.0)** | **0 (0.0)** | **1 (3.0)** | **0 (0.0)** | |
| **Signs of post-bleaching syndrome** | | | | | **0.138** |
| NO | **48 (87.3)** | **13 (100.0)** | **29 (87.9)** | **15 (71.4)** | |
| YES | **7 (12.7)** | **0 (0.0)** | **4 (12.1)** | **6 (28.6)** | |
| **Telangiectasia** | | | | | **0.593** |
| NO | **53 (96.4)** | **13 (100.0)** | **32 (97.0)** | **19 (90.5)** | |
| YES | **2 (3.6)** | **0 (0.0)** | **1 (3.0)** | **2 (9.5)** | |
| **Asteatotic eczema** | | | | | **0.434** |
| NO | **53 (96.4)** | **12 (92.3)** | **33 (100.0)** | **20 (95.2)** | |
| YES | **2 (3.6)** | **1 (7.7)** | **0 (0.0)** | **1 (4.8)** | |
| **Ulcer** | | | | | **0.191** |

| | | | | | |
|---|---|---|---|---|---|
| NO | **47 (85.5)** | **8 (61.5)** | **27 (81.8)** | **15 (71.4)** | |
| YES | **8 (14.5)** | **5 (38.5)** | **6 (18.2)** | **6 (28.6)** | |
| **Photosensitivity** | | | | | **0.408** |
| NO | **53 (6.4)** | **12 (92.3)** | **30 (90.9)** | **21(100.0)** | |
| YES | **2 (3.6)** | **1 (7.7)** | **3 (9.1)** | **0 (.0)** | |
| **Surgical scar** | | | | | **0.761** |
| NO | **39 (70.9)** | **10 (76.9)** | **26 (78.8)** | **14 (66.7)** | |
| YES | **16 (29.1)** | **3 (23.1)** | **7 (21.2)** | **7 (33.3)** | |
| **Scarification marks** | | | | | **0.872** |
| NO | **50 (90.9)** | **11 (84.6)** | **29 (87.9)** | **19 (90.5)** | |
| YES | **5 (9.1)** | **2 (15.4)** | **4 (12.1)** | **2 (9.5)** | |
| **Tattoo** | | | | | **0.841** |
| NO | **52 (94.5)** | **13 (100.0)** | **30 (90.9)** | **20 (95.2)** | |
| YES | **3 (5.5)** | **0 (0.0)** | **3 (9.1)** | **1 (4.8)** | |

**Discussion**

At advanced age it is important that nutritional requirements are adequately optimally met. When this is not so malnutrition can result from an imbalance between nutrient intake and energy requirements that can leave negative impact. This can manifest as undernutrition or over-nutrition.

In this study about 10% of the participants were underweight, which is a significant proportion of the participants suggesting that undernutrition may be a problem among elderly people in Rivers State, Nigeria. It is less than results from a study carried out in Ilorin, Nigeria where the prevalence of undernutrition in the elderly was 14%.[8] The difference between the two studies may be due to the fact that the Ilorin study examined geriatric patients from various departments while this study looked at those from internal medicine. However this high prevalence of undernutrition calls for closer attention to the nutrition of elderly people. The results for this study however falls within the range for underweight prevalence among elderly people as found in a review of studies in Africa.[9] It is also less than the values gotten from a study from a national survey in Bangladesh.

Results in this study found 17.2% of the participants to be obese while 27% were overweight. Overall over nutrition was more in females than males. Similar results were found in a study done in Kwara State, Nigeria were about 25% of the participants had overnutrition.[8] It also falls within the range concluded as prevalence of over nutrition in Africa according to a review but lower than values gotten from Egypt.[10] However values from Bangladesh are lower than those in this present study but lower than prevalence of United States where 33% of men and 39% of

women are obese.[11, 12] This suggests that the prevalence of obesity in Nigeria lies mid-way between the values for western countries and South East Asian countries.

The existence of both undernutrition and obesity in elderly suggest that double burden of malnutrition exist among the elderly in Rivers State. This represents a major challenge to government authorities and public to meet the health challenges involved in handling both conditions as it means hunger exists side by side with the threat of diet related non-communicable diseases.[13]

Xerosis was the most common cutaneous lesion among the underweight participants in this study while DPN was the most common cutaneous lesion in those obese. Xerosis has been noted as noted as a common skin problem in elderly and its occurrence suggested to be multifactorial.[14] This study found higher frequency of xerosis, pruritus, wrinkles and IGH in underweight elderly people compared with those who were normal weight or overweight. However this was not statistically significant.

Xerosis is basically dry skin and is common among older people.[14] Among elderly people in Japan similar results were found as those with BMI more than 25kg/$m^2$ had significantly decreased manifestation of dry skin.[15] Xerosis may be associated with underweight due to the fact that it is caused by lack of epidermal lipids which are likely to be caused by poor nourishment.

Underweight participants had an increased prevalence of IGH which is a benign leukoderma characterized by multiple discrete round or oval nodules on sun exposed areas.[16] It is a condition found more in elderly and is suggested to be a process of aging. Hypopigmentation has been associated with undernutrition in another study possibly due to inadequate nutrition leading to reduction in melanocytes or local inhibition of melanogenesis.[17]

Wrinkles in the participants were more in those underweight than those with normal Body Mass Index or those overweight. This similar to a study done in Poland were there was statistically significant correlation between BMI and wrinkles. A study carried out across Europe also showed that lower body mass index was significantly associated with wrinkling. This is possibly because those with facial fat are those with higher BMI as fat has a filler effect.[18, 19]

Pruritus was found more in underweight according to this study. This is contrary to another study conducted among adults in Germany that found pruritus more among those with elevated body mass index.[20] The difference in this study may be participants included adults of all ages not just elderly people. However pruritus has been found to be symptom of severe weight loss and abating on restoration of weight thus weight loss may be a possible explanation for pruritus occurring more in the underweight.[21]

DPN was found more in obese elderly compared to those with normal weight or underweight. This condition manifests as multiple, small, smooth, firm, dark to black papules usually on the

face and neck.[22] This finding correlates to that of a study in South East Asia where strong association was found between DPN and obesity. Another study in Mexico also found DPN in majority of the obese patients. It has been observed that the most common co-morbidity with the lesion is obesity and has been further linked to insulin resistance.[23, 24] The finding of its being common in the obese in this study lends credence to its link to insulin resistance even in elderly population in Rivers State. This seems to suggest that DPN would be an indication to screen for insulin resistance like high blood glucose.

Post bleaching syndrome was found more in obese patients compared with those normal weight or underweight although this was not statistically significant. This syndrome refers to primary side effects of use skin bleaching products namely ochronosis, straie atrophica and epidermal atrophy and these tend to be more permanent side effects on the skin.[25] The presence of straie on skin on its own has been found to be associated with obesity probably because of greater likelihood of skin stretching in obese people. The reason why post bleaching syndrome could be associated with obesity may be due to the effect of steroid based bleaching cream on the skin. Steroid based creams when used chronically can lead to features of Cushing syndrome like moon face, truncal obesity.[26] It may also be due to the various effects obesity has on the skin as being obese affects the physiology, chemical balance, wound healing of skin as well as resistance to infection.[4]

Scars were found more frequently in those obese than but the difference was not statistically significant and more research is needed. However it is postulated that wound healing may be slower in those with obesity due to issues like tension on wound edges and reduced microperfusion.[27] In one study those with higher body mass index had more hypertrophic scars compared with those with lower BMI.[28]

## CONCLUSION

Both over nutrition and under nutrition are to likely occur in elderly people. Females have a higher risk of being malnourished. The manifestations of cutaneous lesions in the elderly are likely to be influenced by their nutritional status. Xerosis was the most common cutaneous lesion among the underweight participants. DPN seen more in obesity is an indication of insulin resistance in elderly people in Nigeria and when seen, further investigations should be done. Complaints or observance of cutaneous lesions in elderly should be a reason to investigate nutrition and the solution may lie in nutrition based treatment. More research is however needed to further evaluate the association between cutaneous lesions and body mass index.

## Consent

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

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