# Correlation between the Body Mass Index and Psoriasis in Dermatology and Venereology Teaching Hospital in Khartoum

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**Abstract**  **Background:** Psoriasis is a common, chronic, disfiguring, noninfectious inflammatory and proliferative condition of the skin, in which both genetic and environmental influences have a critical role. Body Mass Index (BMI) is a simple index of weight for height that is commonly used to classify underweight, overweight and obesity. Several studies suggested a significant correlation between psoriasis and high BMI which may affect adversely the course and the treatment of the disease. **Objectives:** The study aimed to determine the correlation between psoriasis and BMI and to determine the epidemiological characteristics of psoriasis in Sudanese patients involved in the study. **Methodology:** This study was a prospective, observational descriptive hospital-based cross-sectional study, conducted in Dermatology and Venereology Teaching Hospital in Khartoum in the period from August to November 2015, it included 81 psoriatic patients; Questionnaires were filled regarding the patients demographic and medical data of their disease. The weight and height of every patient were measured, and then the body mass indices were calculated and categorized. The data were then analyzed by using statistical package for social science (SPSS). **Results:** 44 males represented (54.3%) and 37 females (45.7%) their ages were between 18 and > 60 years. 72 patients (88.9%) did not have a family history of psoriasis while nine patients (11.1%) had a positive history. Psoriasis vulgaris was the most presented clinical variant (76.5%). The most significant finding in this study is that 33.3% of the patients involved were overweight (BMI 25-29.9), 16% were obese (BMI >30) and 2.5% were morbidly obese patients (BMI ≥ 40), the total percentage of them represented 51.8% of the total number of patients. The mean BMI was found to be 25.34. **Conclusions:** In this study, the body mass indices of more than half of the patients (51.8%) were found higher than the normal. The mean BMI was high (25.34). That may extend the previous reports of the association of psoriasis and the high BMI. Most of the psoriatic patients with high BMI were females (54% of the patients with high BMI). There was no correlation between the BMI and the age of the patient neither with the duration of the disease.

**Keywords**  Body Mass Index, BMI, Psoriasis, Sudan

## 1. Introduction

*Psoriasis* is a common, chronic, disfiguring, noninfectious inflammatory and proliferative condition of the skin, in which both genetic and environmental influences have a critical role. The most characteristic lesions consist of red, scaly, sharply demarcated, indurated plaques present particularly over extensor surfaces and scalp. The disease is enormously variable in duration, the periodicity of flares and extent. Morphological variants are common. *Psoriasis* affects 2–4% of the population. It can start at any age including childhood, with peaks of onset at 15–25 years and 50–60 years. It tends to persist lifelong, fluctuating in extent and severity. It is particularly common in Caucasians but may affect people of any race. About one-third of patients have family members with *psoriasis* [1].

Body Mass Index (BMI) is a simple index of weight for height that is commonly used to classify underweight, overweight, and obesity. It is defined as the weight in kilograms divided by the square of the height in meters $(kg/m^2)$ [2].

Correlation of *psoriasis* with high BMI has been found to be associated with an increased risk of *psoriasis* in general population, and *psoriasis* patients have higher prevalence and incidence of high BMI [3, 4].

High BMI manifested as overweight and obesity has different risk effect on severity and manifestations of psoriasis and might be useful for better evaluating *psoriasis* clinically [5].

One study suggested that obesity at an early age increases the risk of developing Psoriatic Arthropathy (PsA). Adiposity is associated with higher levels of inflammatory cytokines known to be associated with *psoriasis*. Prevention and early treatment of obesity may decrease the risk of PsA [6].

Also, in psoriasis patients, high BMI is associated with a more severe disease, especially in men. Bodyweight control may be necessary for the management of *psoriasis* [7].

It is found that body weight reduction in obese psoriatic patients on biologics may increase the efficacy of the drugs [8].

### Rationale

The calculation of the body mass index (BMI) of patients who have *psoriasis* is necessary, most of the studies concluded that there is a higher prevalence of high BMI among psoriatic patients compared with the general population, which worsen the course of the disease and delay the response to treatment; as well as no similar studies had been made in Sudan.

## 2. Objectives

### General Objective

To determine the correlation between the body mass index (BMI) and *psoriasis* in patients who attended Dermatology and Venereology Teaching Hospital in Khartoum during the period from August to November 2015.

### Specific Objectives

1- To determine the correlation between the body mass index and *psoriasis* in patients attended Khartoum Dermatology and Venereology Teaching Hospital during the period from August to November 2015.

2- To detect the demographic characteristics of *psoriasis* among this study group.

3- To determine the prevalence of different clinical variants of *psoriasis* in this study group.

### Patients and Methods

This was a prospective, observational descriptive hospital-based cross-sectional study.

### B- Study area:

Khartoum Skin and Venereal diseases Teaching Hospital were considered as the study area. The hospital is considered the first specialized hospital in Dermatology and Venereology in Sudan, serving about 200-400 patients every day. Those patients are from Khartoum state and the other states of Sudan.

The hospital is serving the patients 24 hours per day, every day with regular clinics during the daytime (9:00 am – 3:00 pm) and emergency clinics at the rest of the day and during the night.

Those clinics involve general and specialized clinics:

The general clinics are:

1- The outpatient's clinics for the new cases
2- The referred clinics, to follow the old cases.

The specialized clinics are:

1- *Psoriasis* Clinic, once a week serving *psoriasis* patients.
2- Leprosy clinic once a week.
3- Venereal diseases and Andrology Clinic, twice a week.

The hospital has several general wards to serve the in patients (one for the children, other for men and third for women); also, there is a private section.

### Other hospital facilities:

Laboratory services: serving the outpatients and the in patients.-
- Phototherapy section.
- Pharmacy.
- Minor Theater for the minor operations is available.
- Teaching section, including library and lecture theaters

### c- Study period:

The study had been conducted during the period from August to November 2015.

### d- Study population:

All patients are known as Psoriatic cases who attended Skin and Venereal diseases Teaching Hospital in Khartoum during the study period and who met the inclusion criteria were considered in the study.

### - Inclusion criteria:

All Sudanese patients agreed to share the study, with any of *psoriasis* variants who attended the Skin and Venereal diseases Teaching Hospital in Khartoum during the study period.

### - The exclusion criteria:

The patients with one or more of the following criteria were excluded:
1- NonSudanese
2- Patients refused to participate in the study

### e- Sample size and sampling techniques:

It was a probability sampling.
81 patients had been included in the study.

### F- Data collection:

Eighty-one patient is is known to have *psoriasis* and who met the inclusion criteria were included in the study. The diagnosis of *psoriasis* in every case was confirmed by a consultant dermatologist based on the clinical findings (history and clinical examination), and when indicated (in

some doubtful cases) the clinical diagnosis has been supported and confirmed by doing histopathology of skin biopsy.

Then, data were collected from the included patients and were written down in the pre-tested structured questionnaire. The questionnaires were filled by the researcher herself, and data collected from the participated patients regarding their demographic data and some information regarding their *psoriasis*.

Then the length and weight of the patients were measured by using a measuring tape and weighing scale respectively.

After that, the body mass indices of the participated patients were calculated.

**Calculation of the body masses index**

BMI is calculated the same way for both adults and children. The calculation is based on the following formulas [9]:

| Measurement Units | Formula and Calculation |
|---|---|
| **Kilograms and meters (or centimeters)** | Formula: weight (kg) / [height (m)]$^2$<br>With the metric system, the formula for BMI is weight in kilograms divided by height in meters squared. Because height is commonly measured in centimeters, divide height in centimeters by 100 to obtain height in meters.<br>Example: Weight = 68 kg, Height = 165 cm (1.65 m)<br>Calculation: $68 \div (1.65)^2 = 24.98$ |
| **Pounds and inches** | Formula: weight (lb) / [height (in)]$^2$ x 703<br>Calculate BMI by dividing weight in pounds (lbs) by height in inches (in) squared and multiplied by a conversion factor of 703.<br>Example: Weight = 150 lbs, Height = 5'5" (65")<br>Calculation: $[150 \div (65)^2]$ x 703 = 24.96 |

In this study, the body mass indices were calculated by using the first formula. The calculated body mass indices were then categorized into five groups (according to WHO classification of the BMI) [10]:

**Classification of the body mass index:**

| Classification | BMI(kg/m$^2$) | |
|---|---|---|
| | **Principal cut-off points** | **Additional cut-off points** |
| Underweight | <18.50 | <18.50 |
| Normal range | 18.50 - 24.99 | 18.50 - 22.99 |
| | | 23.00 - 24.99 |
| Overweight | ≥25.00 | ≥25.00 |
| Obese | ≥30.00 | ≥30.00 |
| Morbidly obese | ≥40.00 | ≥40.00 |

**G- Data analysis:**

The collected data were analyzed by using Statistical Package for Social Science (SPSS). Descriptive analysis was done for all the questionnaire parameters.

**H- Ethical consideration:**

This study has been presented to the ethical review committee of Sudan Medical Specialization Board (SMSB), Council of dermatology. Permission had been granted from authorities of health care in the study area. Verbal and written consent was taken from every participant.

# 3. Results

This study included 81 patients, 44 of them were males (54.3%), and the remaining 37 patients were females (45.7%), (figure 1). The male to female ratio was 1.19 to 1.
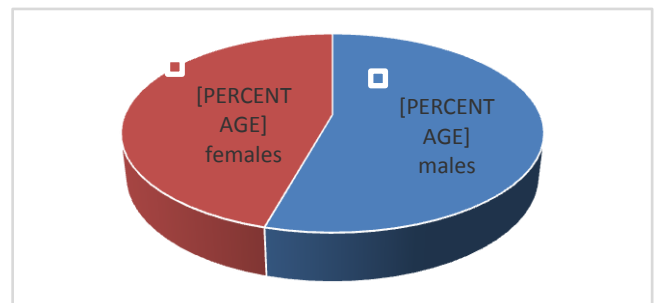


**Figure (1).**   Showed Gender of the Patients in the Correlation between the body mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015

Regarding the ages of patients, all of the patients were adults. There were eight patients whom ages fell in the first group; 6-18 years represented (9.9%). Twenty patients were found to be in between 19 - 30 (24.7%). Twenty-three patients were between 31 and 45 years of age (28.4%). Nineteen patients were included in the fourth group, the age between 46 and 60 (23.5%). The last group was representing the patients whom their ages were more than 60 years (figure 2). The mean age was 41.43 years.

Concerning the residence of patients, 72 patients were residing in the center represented (88.9% of the patients). Four patients were residing in the South (4.9%). Three patients were residing in the West (3.7% of the total). One patient was residing in the north (1.2%). Lastly, also one patient was residing in the East (1.2%), (figure 3).

Regarding the marital status of the patients, fifty-nine patients were married (72.8%). Fifteen patients were single. Five patients were divorced (6.2%). Two patients were a widow (2.5%), (figure 4).

About the level of education; twenty-eight patients had primary school education represented (34.6% of the patients). Twenty-seven patients were secondary school graduates (33.3%). Seven patients were university graduates (8.6%). Two patients had higher education degrees (2.5%). Unfortunately, seventeen patients were illiterate (21% of the total), (figure 5).

The analysis of the data showed that sixty-five patients were of low socioeconomic status represented (80.2%). On the other side, sixteen patients were of average e socioeconomic status (19.8%), (figure 6).

Regarding the duration of *psoriasis*, the patients were classified into five groups. Thirty-six patients represented (44.4%) fell in the first group, the duration of *psoriasis* in this group ranges from 0-5 years. The duration of psoriasis in the second group ranged from 6-10 years, fourteen patients (17.3) were included in this group. Fifteen patients (18.5%) were suffering for 11-15 years from the disease. Nine patients (11.1%) were suffering for 16-20 years. The last group represented the patients whom duration of the disease was more than twenty years; they were seven patients (8.6%), (figure 7).

Regarding the family history, 72 patients represented (88.9%) did not have a family history of *psoriasis* while the remaining nine patients (11.1%) had, (figure 8).

Concerning the different clinical variants of *psoriasis*,

*Psoriasis* Vulgaris represented 76.5% of the cases (62 patients). Six patients (7.4%) presented with palmoplantar psoriasis. Erythrodermic *Psoriasis* and Flexural *Psoriasis* were represented by three patients (3.7%) for each of them. On the other hand, Guttate and Pustular *Psoriasis* were represented by two patients (2.5%) for each of them. While the Psoriatic Arthritis, scalp, and Rupioid *Psoriasis* were represented by one patient (1.2%) for each, (figure 9).

Concerning the investigations that could be performed to confirm the diagnosis of *psoriasis*; histopathology for skin biopsy was done to confirm the diagnosis in 25 patients (30.9%) while the remaining 56 patients (69.1%) were diagnosed clinically depending on diagnostic criteria (typical lesions and distribution of *psoriasis*) without need for histopathology, (figure 10).
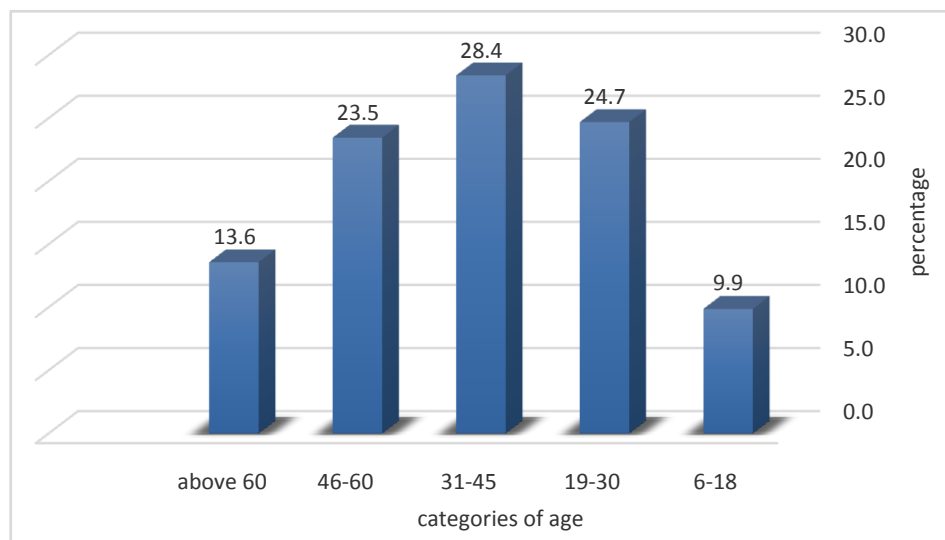


**Figure (2).** Showed Age of the Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015
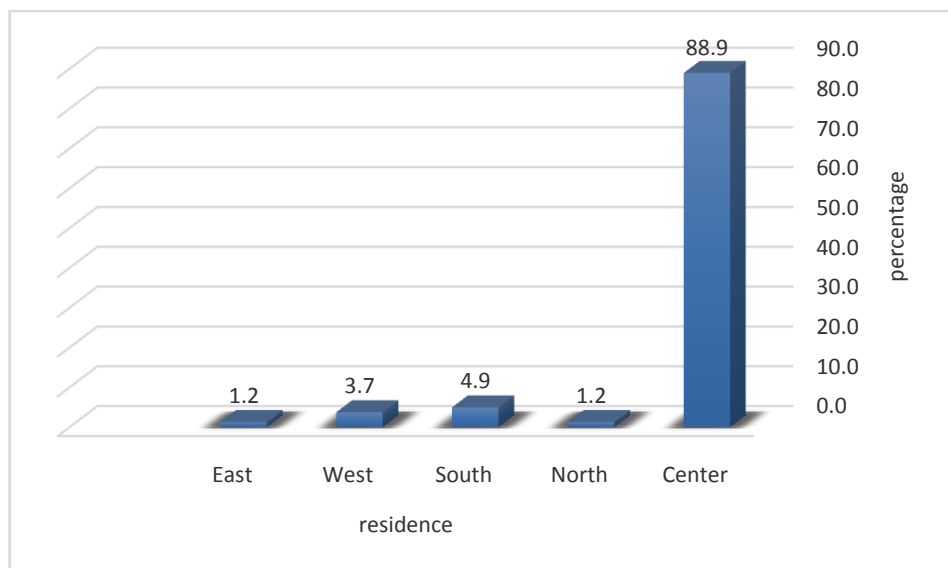


**Figure (3).** Showed Residence of the Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the period from August-November 2015

**Figure (4).** Showed the Marital Status of the Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology
Teaching Hospital in Khartoum in the Period from August-November 2015
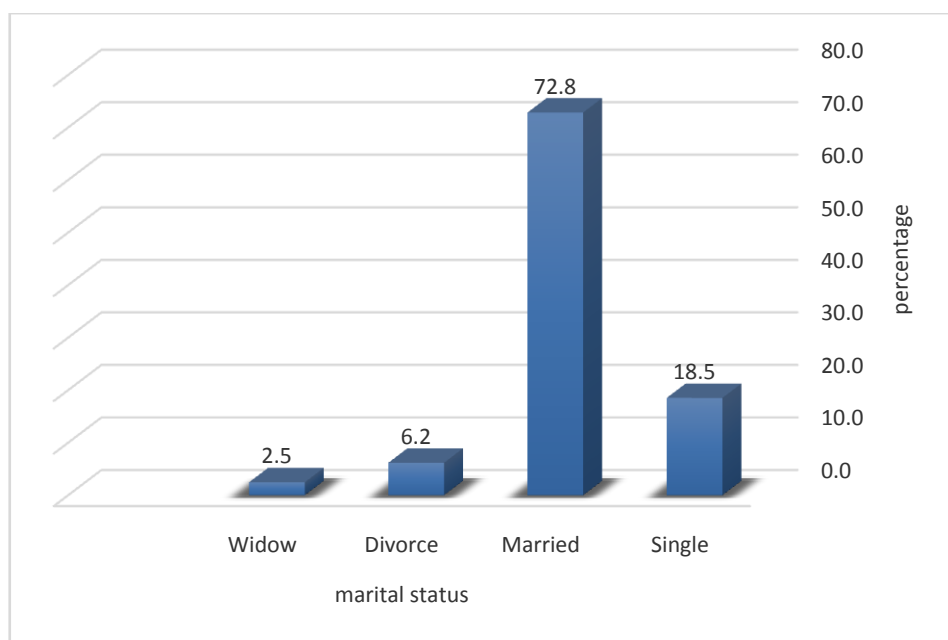


**Figure (5).** Showed the level of Education of the Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology
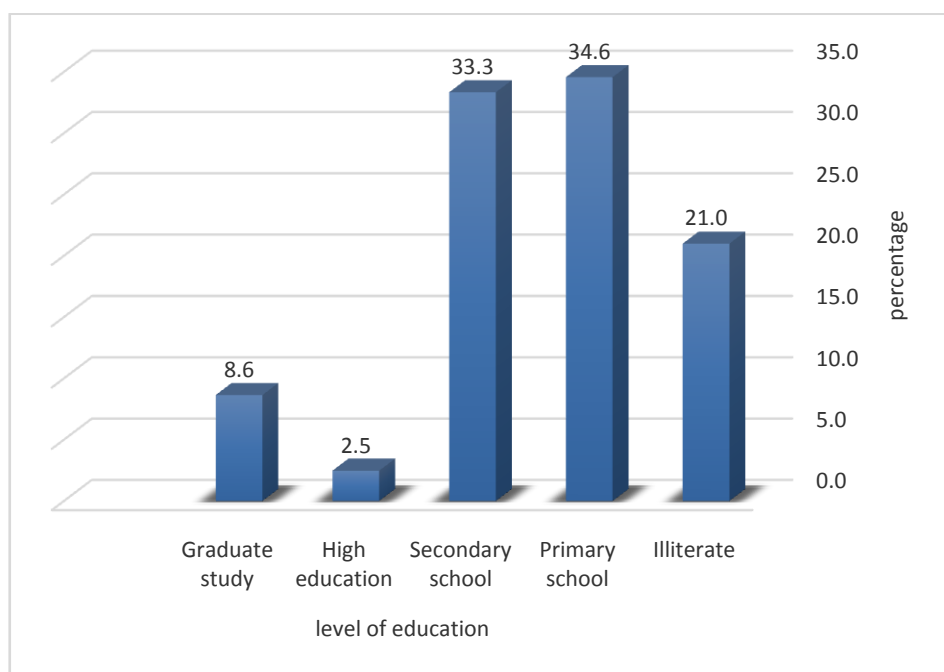Teaching Hospital in Khartoum in the Period from August-November 2015

**Table (1).** Showed the Patient Body Mass Indices (BMI) about Gender of the Patients in the Correlation between the Body Mass Index and *Psoriasis* in
Dermatology and Venereology Teaching Hospital in Khartoum in the period from August-November 2015

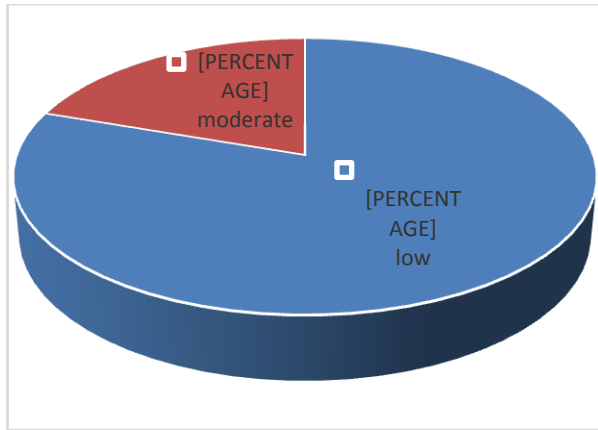| Gender of Patient | Category of the patient body mass index | | | | | Total |
|---|---|---|---|---|---|---|
| | Underweight (<18.5) | normal (18.5 - 24.9) | Overweight (25.0 - 29.9) | Obese (>30) | Morbidly obese (≥40) | |
| Male | 6 | 19 | 17 | 2 | 0 | 44 |
| Female | 4 | 10 | 10 | 11 | 2 | 37 |
| Total | 10 | 29 | 27 | 13 | 2 | 81 |

**Figure (6).** Showed the Socioeconomic Status of the Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015

The main aim of this study was to calculate the body mass indices of the patients and to correlate them with the disease. The body mass indices of the patients had been calculated

and categorized into five classes as follow:

The first class was for the underweight patients (BMI <18.5), it included ten patients represented (12.3% of the total). The second class was for the patients with normal body mass indices (BMI 18.5-24.9); 29 patients (35.8%) fell in this class. The third one was for the overweight patients (BMI 25-29.9); they were 27 patients (33.3%). The fourth group included the obese patients (BMI >30), they were 13 patients (16%). The last group included the morbidly obese patients (BMI ≥ 40); they were two patients (2.5%), (figure 11).

The mean BMI was found to be 25.34.

Regarding the distribution of the body mass indices about the gender of the patients; for the males: 19 patients represented (23.45%) were with normal BMI, 17 were overweight (20.98%), 6 were underweight (7.4%) and two were obese (2.47%). For the females: 10 were with normal BMI (12.35%), ten were overweight (12.35%), 11 were obese (13.58%), two were morbidly obese (2.47%), and four were underweight (4.94%), (Table 1).
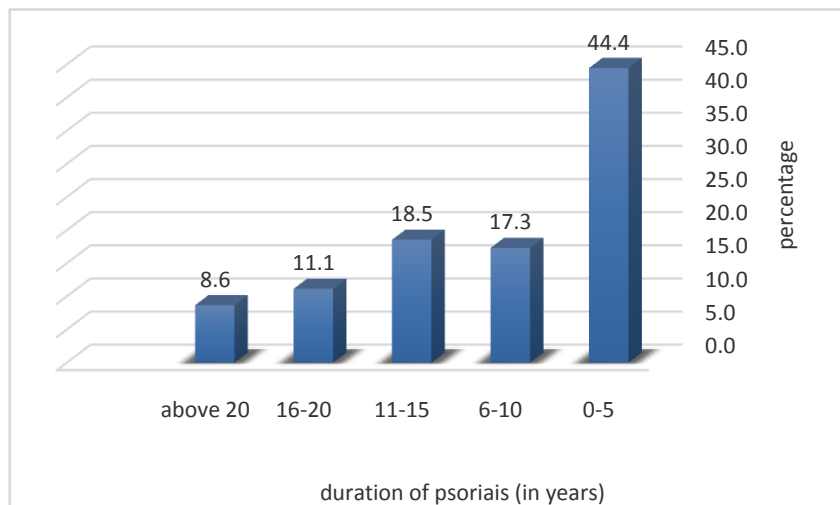


**Figure (7).** Showed the Duration of Psoriasis in Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015



**Figure (8).** Showed the Family History of Psoriasis in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the period from August-November 2015
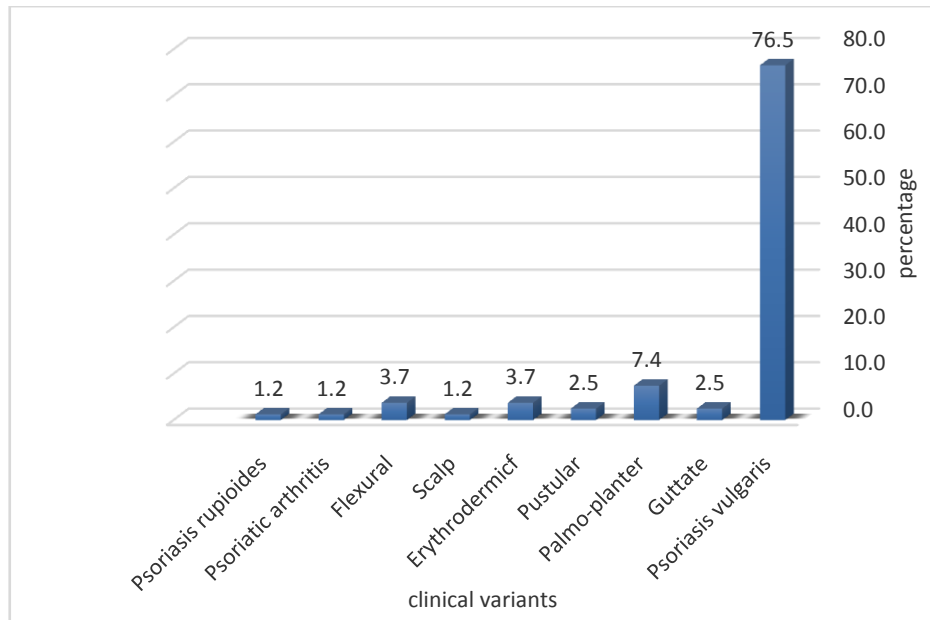
**Figure (9).** Showed the Clinical Variants of Psoriasis in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015
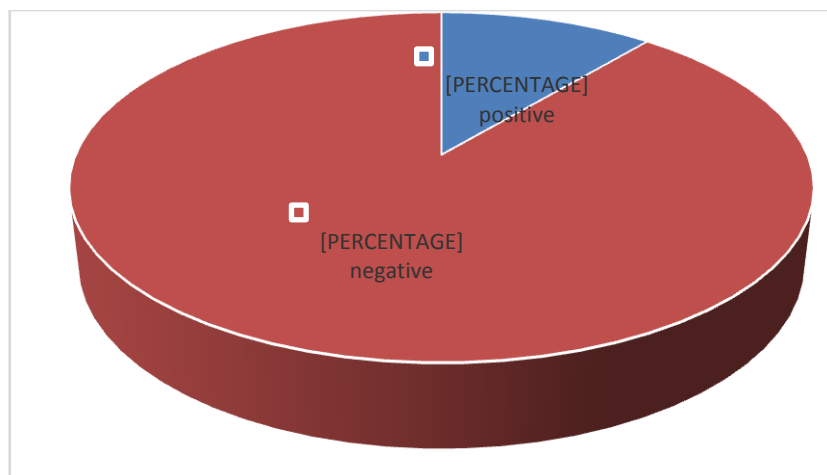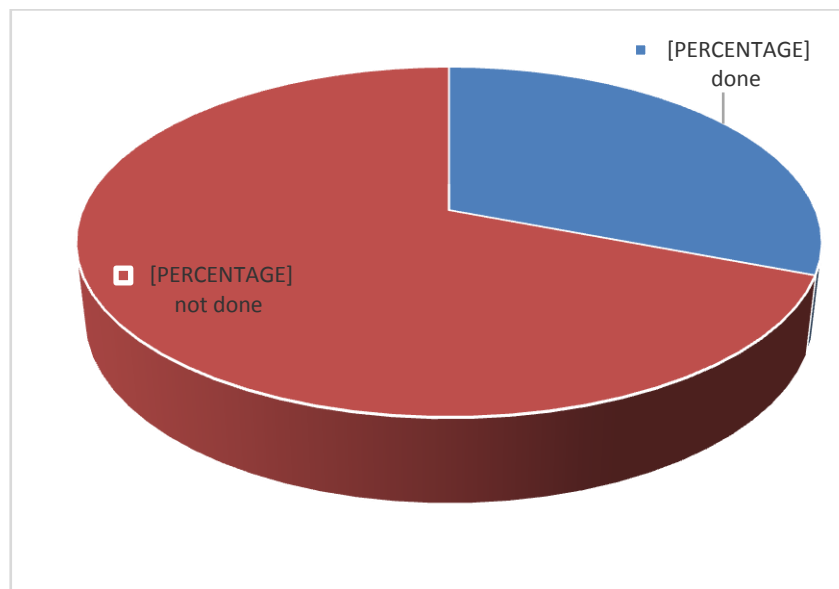


**Figure (10).** Showed Histopathology Performance for Psoriatic Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015

**Table (2).** Showed the Body Mass Indices about Age of Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015

| Age of Patient | Category of the patient body mass index | | | | | Total |
| --- | --- | --- | --- | --- | --- | --- |
| | Underweight (<18.5) | normal (18.5 - 24.9) | Overweight (25.0 - 29.9) | Obese (>30) | Morbidly obese (≥40) | |
| 6-18 | 3 | 4 | 1 | 0 | 0 | 8 |
| 19-30 | 4 | 6 | 6 | 3 | 1 | 20 |
| 31-45 | 0 | 8 | 11 | 3 | 1 | 23 |
| 46-60 | 2 | 6 | 5 | 6 | 0 | 19 |
| Above 60 | 1 | 5 | 4 | 1 | 0 | 11 |
| Total | 10 | 29 | 27 | 13 | 2 | 81 |

The BMI was not correlating with the age of the patients (P-value was 0.405 > 0.01 which was also not significant).
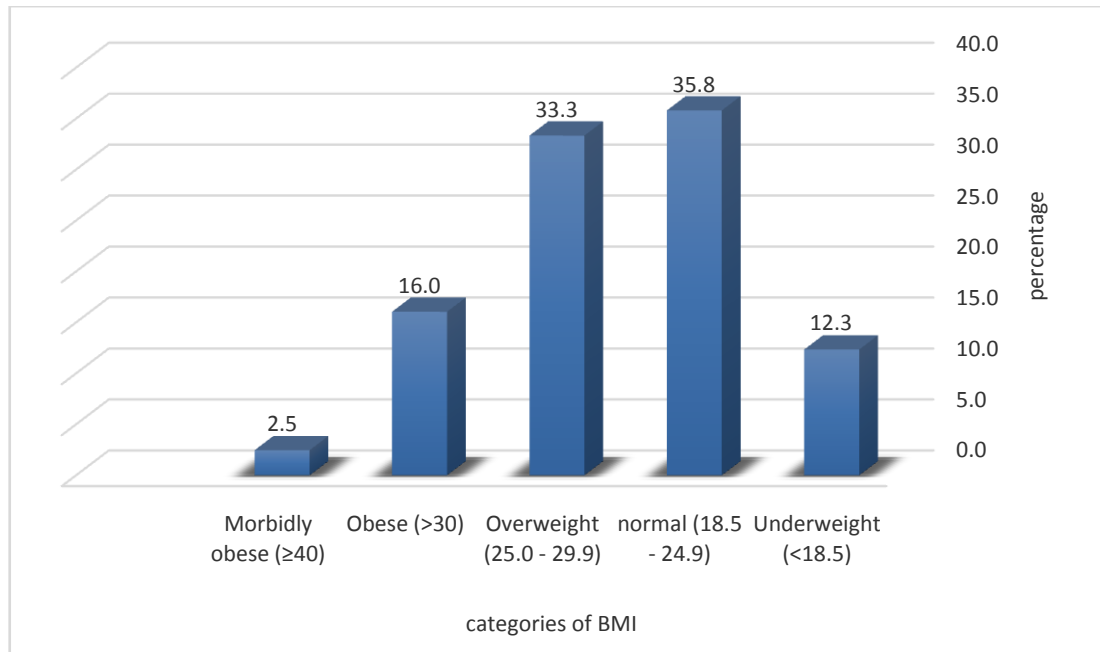
**Figure (11).** Showed the BMIs of Psoriatic Patients in the Correlation between the Body Mass Index and *Psoriasis* in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015

**Table (3).** Showed the Body Mass Indices about the Clinical Variants of Psoriasis in the Correlation between the Body Mass Index and Psoriasis in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015

| Clinical variants | Category of the patient body mass index | | | | | Total |
|---|---|---|---|---|---|---|
| | Underweight (<18.5) | Normal (18.5 - 24.9) | Overweight (25.0 - 29.9) | Obese (>30) | Morbidly obese (≥40) | |
| Psoriasis vulgaris | 5 | 23 | 21 | 11 | 2 | 62 |
| Guttate | 1 | 1 | 0 | 0 | 0 | 2 |
| Palmo-planter | 1 | 3 | 2 | 0 | 0 | 6 |
| Pustular | 1 | 0 | 1 | 0 | 0 | 2 |
| Erythrodermic | 1 | 1 | 1 | 0 | 0 | 3 |
| Scalp | 0 | 0 | 1 | 0 | 0 | 1 |
| Flexural | 0 | 1 | 1 | 1 | 0 | 3 |
| PsoriaticArthritis | 0 | 0 | 0 | 1 | 0 | 1 |
| Psoriasis Rrupioides | 1 | 0 | 0 | 0 | 0 | 1 |
| Total | 10 | 29 | 27 | 13 | 2 | 81 |

**Table (4).** Showed the Body Mass Indices about Duration of Psoriasis (in years) in the Correlation between the Body Mass Index and Psoriasis in Dermatology and Venereology Teaching Hospital in Khartoum in the Period from August-November 2015

| Duration of psoriasis in yea | Category of the patient body mass index | | | | | Total |
|---|---|---|---|---|---|---|
| | Underweight (<18.5) | Normal (18.5 - 24.9) | Overweight (25.0 - 29.9) | Obese (>30) | Morbidly obese (≥40) | |
| 0-5 | 7 | 14 | 6 | 8 | 1 | 36 |
| 6-10 | 0 | 5 | 8 | 1 | 0 | 14 |
| 11-15 | 1 | 7 | 6 | 1 | 0 | 15 |
| 16-20 | 2 | 1 | 3 | 2 | 1 | 9 |
| Above 20 | 0 | 2 | 4 | 1 | 0 | 7 |
| Total | 10 | 29 | 27 | 13 | 2 | 81 |

The body mass index was not correlating with the duration of the disease (P-value was not significant, it was 0.326 > 0.01).

Regarding the distribution of the body mass index about the age of the patients; first age group from 6 to 18 years: 3 represented (3.70%) were underweight, four were with normal BMI (4.94%), and one was overweight (1.23%). From 19 to 30 years: 4 were underweight (4.94%), six were normal (7.41%), six were overweight (7.41%), three were obese (3.7%), and 1 was morbidly obese (1.23%). From 31 to 45 years: 8 were with normal BMI (9.88%), 11 were overweight (13.58%), 3 were obese (3.7%) and 1 was morbidly obese (1.23%). From 46-60 years age group, two patients represented (2.47%) were underweight, 6 with normal BMI (7.41%), five were overweight (6.17%), and six cases were obese 7.41% (Table 2). The BMI was not correlating with the age of the patients (P-value was 0.405 > 0.01 which was not significant).

Concerning the distribution of the body mass indices of the clinical variants of *psoriasis*; most of the patients in the five categories of BMI were patients presented with *Psoriasis* Vulgaris and few patients presented with other variants. For *Psoriasis* Vulgaris: 23 patients represented (28.40%) were with normal BMI, 21 were overweight (25.93%), 11 were obese (13.58%), five were underweight (6.17%), and two were morbidly obese 2.47% (Table 3).

The distribution of the body mass indices in relation to duration of psoriasis (in years) showed that: when the duration was <5 years: 7 patients represented (8.64%) were underweight, 14 with normal weight (17.28%), 6 were overweight (7.41%), 8 were obese (9.88%), and 1 was morbidly obese (1.23%). Duration from 6 to 10 years: 5 with normal BMI (6.17), 8 were overweight (9.88%), and one patient was obese (1.23%). Duration from 11 to 15 years: 1 patient was underweight (1.23%), seven were with normal BMIs (8.64%), six were overweight (7.41%), and one was obese (1.23%). Duration from 16 to 20 years: 2 patients were underweight (2.47%), one was with normal weight (1.23%), three were overweight (3.70%), and two were obese (2.47%). Duration >20 years: 2 patients were with normal weight (2.47%), four were overweight (4.94%), and one patient was obese (1.23%), (Table 4). The body mass index was not correlating with the duration of the disease (P-value was not significant, it was 0.326 > 0.01).

## 4. Discussion

In this study 81 patients included, males represented 54.3%, and the remaining 45.7% were females. Male to female ratio was 1.19 to 1 with more prevalence of psoriasis among males. These results were approximately similar to the result of other study concluded that over half of the *ps*oriasis population (54.7%) were males (Kimball AB et al., 2014) [11]. Also, another cross-sectional study (Islam MT et al, 2011) conducted on 102 cases having clinical manifestation of *psoriasis* to (or "intending to") evaluating the epidemiological determinants of *psoriasis* concluded that 68.6% patients were males and 31.4% were females with a male to female ratio of 2.18:1 [11].

Most of the cases fell between 19 and 45 years. The mean age was found to be 41.43 years, which is lower than a mean age of 48.6 years calculated in patients enrolled in the Psoriasis Longitudinal Assessment and Registry (PSOLAR) to evaluate demographic and disease characteristics of psoriasis (Kimball AB et al., 2014) [12].

Only 11.1%, (9) patients had positive family history of *psoriasis*, a percentage close to 15.7% of positive history concluded in a similar study (Islam MT et al, 2011) [12], while an epidemiological study in Greece to determine characteristics of *psoriasis* found that 35% of patients reported a positive family history of psoriasis(Rigopoulos D et al., 2010) [13].

The most common clinical variant of psoriasis was Psoriasis vulgaris (76.5%) followed by palmoplantar psoriasis (7.4%). Erythrodermic psoriasis and flexural psoriasis represented (3.7%) for each of them. Guttate and Pustular *Psoriasis* represented (2.5%) for each of them. These results were slightly different from those of cross-sectional study among 296 Malaysian patients with *psoriasis*, showed that the most common clinical presentation was chronic plaque psoriasis (89.9%), followed by erythrodermic psoriasis (4.7%), Guttate *Psoriasis* (3.0%) and Pustular *Psoriasis* (1.7%) (Loo CH et al., 2015) [14].

The most significant finding in this study is that 33.3% of the patients (27 patients) involved were overweight (BMI 25-29.9), 16% (13 patients) were obese (BMI >30) and 2.5% (2 patients) were morbidly obese patients (BMI ≥ 40). The total percentage of them represented 51.8% of the total number of patients, represented almost more than the half of the patients, a high percentage, and that might extends previous reports of an association between psoriasis and high BMI, (Duarte GV et al., 2013) [15].

To evaluate the occurrence of obesity and dyslipidemia in patients with psoriasis in Manaus (in northern Brazil); a study included 72 patients was done, 16 (22.2%) were overweight, and 20 (27.8%) were obese (Santos M et al., 2013) [16].

The mean BMI was found to be 25.34 compared to a BMI of 28.0 calculated in a German study (Jacobi A et al., 2015) aimed to assess the prevalence of obesity in patients with psoriasis in Germany; that study concluded that the prevalence of obesity in patients with psoriasis is higher than in the normal population and also showed that the trend towards a higher BMI in patients with psoriasis continues over time [17].

Most of the males BMIs were either normal: 23.46% (19 patients) or overweight 20.99% (17 patients). On the other hand, most of the female BMIs were higher than normal; overweight were 10 females (12.35%), obese were 11 (13.58%), and two females (2.47%) were morbidly obese, this showed that in this study most of the psoriatic patients with high BMI were females (54% of the total patients with high BMI).

Moreover, body mass index, irrespective of adjustment for diabetes mellitus, age, skin Phototype, gender, family history of diabetes mellitus or hip/waist ratio. Qualitatively elevated HOMA-IR levels (>3.8) were also significantly associated.

## 5. Conclusions

In this study, the body mass indices (BMI) of more than half of the patients (51.8%) were found higher than the normal. The mean BMI was high (25.34). However, there was a negative correlation between the BMI and age of patients and also a negative correlation between the BMI and the duration of the disease. In this study, most of the psoriatic patients with high BMI were females (54% of the total no. of patients with high BMIs).

This study also provided epidemiological information regarding psoriasis in Sudanese patients:

- Most of the patients were between 19-45 years old (53.1%). The mean age was found to be 41.43 years.
- Prevalence of psoriasis was found more among males (54.3%). Male to female ratio was 1.9:1.
- Most of the patients had no family history of psoriasis (88.9%).
- Psoriasis vulgaris was the commonest clinical variant (76.5%), followed by Palmo-planter psoriasis (7.4%).

## 6. Recommendations

1. Further studies among larger groups of psoriatic patients in Sudan to determine the correlation between *psoriasis* severity and BMI and to identify how the BMI (especially the high BMI) may affect *psoriasis* course and treatment.
2. Advising the overweight and obese patients to normalize their BMI to achieve better control of *psoriasis* (depending on previous studies and reports).

## REFERENCES

[1] Burns DA, Breathnach SM, CoxNH, Griffiths CEM. *Rook's Textbook of Dermatology*, 7 thed. USA: Blackwell Science; 2004: page 35.1.

[2] WHO contributors. *BMI classification. (Accessed 27 August 2015).*

[3] McGowan JW, Pearce DJ, Chen J, Richmond D, Balkrishnan R, Feldman SR. The Skinny on Psoriasis and Obesity. *Arch Dermatol*. 2005; 141(12): 1601-1602.

[4] Duarte GV, Oliveira M d., Cardoso T M., Follador I, Silva TS., Cavalheiro CM. Nonato W, Carvalho EM. Association between obesity measured by different parameters and severity of psoriasis. *International Journal of Dermatology*, 52: 177–181.

[5] Zhang, Zhu KJ, Zheng HF, Cui Y, Zhou FS, Chen YL, et al. The effect of overweight and obesity on psoriasis patients in Chinese Han population: a hospital-based study. *J Eur Acad Dermatol Venereol*.2011 Jan; 25(1): 87-91.

[6] Soltani-Arabshahi R, Wong B, Feng BJ, Goldgar DE, Duffin KC, Krueger GG. Obesity in early adulthood as a risk factor for psoriatic arthritis. *Arch Dermatol*.2010 Jul; 146(7): 721-6.

[7] Huang Y, Yang LC, Hui RY, Chang YC, Yang YW, Yang CH, Chen YH, Chung, WH, Kuan YZ. Chiu CS. Relationships between obesity and the clinical severity of psoriasis in Taiwan. *Journal of the European Academy of Dermatology and Venereology*, 24: (1)1035–1039.

[8] Al-Mutairi N, Nour T. The effect of weight reduction on treatment outcomes in obese patients with psoriasis on biologic therapy: a randomized controlled prospective trial. *Expert Opin Biol Ther*. 2014 Jun; 14(6):749-56.

[9] CDC contributers. *About Adult BMI. http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/ (accessed 27 August 2015).*

[10] WHO contributers. *BMI classification. http://apps.who.int/bmi/index (accessed 27 August 2015).*

[11] Kimball AB, Leonardi C, Stahle M, Gulliver W, Chevrier M, Fakharzadeh S, et al. Demography, baseline disease characteristics and treatment history of patients with psoriasis enrolled in a multicentre, prospective, disease-based registry (PSOLAR). *Br J Dermatol* 2014 Jul; 171(1):137-47.

[12] Islam MT, Paul HK, Zakaria SM, Islam MM, Shafiquzzaman M. Epidemiological determinants of psoriasis. *Mymensingh Med J* January 2011; 20(1): 9-15.

[13] Kimball AB, Leonardi C, Stahle M, Gulliver W, Chevrier M, Fakharzadeh S, et al. Demography, baseline disease characteristics and treatment history of patients with psoriasis enrolled in a multicentre, prospective, disease-based registry (PSOLAR). *Br J Dermatol* 2014 Jul; 171(1): 137-47.

[14] Islam MT, Paul HK, Zakaria SM, Islam MM, Shafiquzzaman M. Epidemiological determinants of psoriasis. *Mymensingh Med J* January 2011; 20(1): 9-15.

[15] Rigopoulos D, Gregoriou S, Katrinaki A, Korfitis C, Larios G, Stamou C, Mourellou O, et al. Characteristics of psoriasis in Greece: an epidemiological study of a population in a sunny Mediterraneanclimate. *Eur J Dermatol*. 2010 Mar-Apr; 20(2): 189-95.

[16] Loo CH, Chan YC, Lee KQ, Tharmalingam P, Tan WC. Clinical profile, morbidity and outcome of adult patients with psoriasis at a district hospital in Northern Malaysia. *Med J Malaysia* 2015 Jun; 70(3): 177-81.

[17] Duarte GV, Oliveira Mde F, Cardoso TM, Follador I, Silva TS, Cavalheiro CM, et al. Association between obesity measured by different parameters and severity of psoriasis. *Int J Dermatol*. 2013 Feb; 52(2): 177-81.

[18] Santos M, Fonseca HM, Jalkh AP, Gomes GP, Cavalcante Ade S. Obesity and dyslipidemia in patients with psoriasis treated at a dermatologic clinic in Manaus. *An Bras Dermatol*. 2013 Nov-Dec; 88(6): 913-6.

[19] Jacobi A, Langenbruch A, Purwins S, Augustin M, Radtke MA. Prevalence of Obesity in Patients with Psoriasis: Results of the National Study PsoHealth3.*Dermatology.* 2015; 231(3): 231-8.