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Mapping the nexus: tracing blood pressure changes in patients with psoriasis

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Abstract

Psoriasis is a chronic condition driven by genetics, immune dysfunction, and environmental factors, impacting the skin, nails, joints, and potentially more. Understanding the correlation between psoriasis severity and blood pressure is crucial for mitigating the risk of cardiovascular comorbidities in affected patients. The aim of the study was to analyze the correlation between blood pressure and the duration and severity of psoriasis in affected patients. This is a cross-sectional study that included 150 subjects (100 psoriasis patients and 50 controls). After thorough history taking and complete general physical and dermatological examinations, the patients were divided into various grades of severity of the disease based on the Psoriasis Area Severity Index. Blood pressure of all subjects was measured. Patients with psoriasis have significantly higher levels of both systolic blood pressure and diastolic blood pressure than the controls ($p=0.003$ and $p<0.001$, respectively). A linear positive correlation was found between the systolic blood pressure ($R^2=0.768$) and diastolic blood pressure ($R^2=0.550$) and the duration of the disease. Similarly, a significant linear positive correlation was found between the severity of the disease and systolic blood pressure ($R^2=0.196$) and also the diastolic blood pressure ($R^2=0.119$). Multivariate regression analysis confirmed that disease severity and duration independently predict elevated blood pressure ($p<0.05$). This study establishes the association of psoriasis with increased blood pressure and its correlation with severity and duration, shedding light on the complex relationship between the disease and cardiovascular health.

Key words: blood pressure, psoriasis, PASI.

Introduction

Psoriasis is a complex, chronic condition influenced by genetic predisposition, immune system dysfunction, and environmental triggers, affecting the skin, nails, joints, and potentially other bodily systems [1]. While the precise etiology remains elusive, research suggests a multifaceted interplay between genetic, environmental, and immunological factors contributes to its development [2]. Key drivers of the disease include systemic inflammation and oxidative stress, which collectively exacerbate the condition [3].

Patients with psoriasis face a significantly elevated risk of cardiovascular disease, irrespective of conventional risk factors such as high cholesterol, smoking, and obesity. Those with moderate to severe psoriasis, particularly when onset occurs early, are more likely to develop metabolic syndrome and atherosclerosis, leading to increased cardiovascular events, morbidity, and mortality [4]. Several mechanisms have been proposed to explain this heightened cardiovascular risk, including shared genetic predispositions, common inflammatory pathways, altered adipokine secretion, insulin resistance, modified lipoprotein profiles, impaired angiogenesis, oxidative stress, microparticle release, and hypercoagulability [5]. Notably, subtle indicators of cardiovascular dysfunction are frequently detected in psoriatic patients, even in the absence of traditional risk factors [6].

The precise link between psoriasis and hypertension remains elusive, despite shared underlying risk factors such as obesity and smoking. However, numerous studies have consistently demonstrated a distinct association between psoriasis and hypertension, even after accounting for these common risk factors [7]. Given this complex relationship, it is crucial to identify and address subtle cardiovascular abnormalities at an early stage, enabling timely intervention and effective management to enhance overall survival rates in patients with psoriasis.

Assessing blood pressure offers a straightforward, non-invasive method for identifying early signs of cardiovascular impairment [8]. This study aimed to explore the correlation between blood pressure and the duration and severity of psoriasis in affected patients.**Materials and Methods**

After obtaining clearance from the institutional ethics committee (BFUHS/2k21p-TH/14770), 150 subjects (100 patients of psoriasis and 50 controls) were recruited for this cross-sectional study.

Inclusion criteria:

1. All cases of clinically diagnosed psoriasis of all ages and belonging to both sexes, presenting to the department of Dermatology
2. Patients visiting the dermatology department for superficial cutaneous infections without evidence of any cutaneous or systemic inflammatory disease were recruited as controls.

Exclusion criteria:

1. Subjects with known organic heart disease.
2. Subjects with cutaneous and/or systemic inflammatory disorders.
3. Subjects not willing to take part in the study.

A detailed history was taken, including family history of psoriasis or cardiovascular diseases, comorbidities, and ongoing medications, including anti-hypertensive drugs. A complete dermatological examination of the type of lesions was done along with the general physical examination. At the initial visit, each patient's age, sex, weight, height, duration and morphological type of psoriasis, BSA (Body Surface Area) involved, PASI (Psoriasis Area Severity Index), nail changes, joint involvement, drug history and family history was recorded. The patients were divided into various grades of severity of the disease based on PASI as follows [9]:

Mild disease- PASI<7

Moderate disease- PASI= 7-12

Severe disease- PASI>12

Based on the duration of the disease, the patients were classified into the following two groups:

1. Those with disease duration of <10 years.
2. Those with disease duration of >10 years.

Blood pressure measurement- Blood pressure of all the subjects was measured using the manual auscultatory method using a sphygmomanometer and a stethoscope.

Statistical Analysis- All the collected data was entered in Microsoft excel sheet and was analysed statistically using SPSS V.22 statistical analysis software. The numerical data was expressed as mean ± SD and categorical data expressed as number (%). For comparisons involving more than two groups, one-way ANOVA was used, followed by post-hoc Turkey tests for pairwise comparisons. Chi square test was applied to find out statistical significance between qualitative data and t-test was applied to find out statistical significance between quantitative data. For finding out the strength of correlation between two variables, Pearson correlation coefficient was used. Multivariare regression analysis was performed to evaluate the independent effects of disease duration and severity on blood pressure, adjusting for age, sex, and comorbidities. A p-value of <0.05 was considered significant.

Results

A total of 150 subjects were recruited for the study (100 patients of psoriasis and 50 controls). Table 1 summarizes the demographic and clinical characteristics of the study population. The overall mean age of patients with psoriasis was 45±13 years and of controls was 45±15 years. The difference between both the groups was not statistically different (p=0.118). In the control group, there were 34(68%) males and 16(32%) females. In the psoriasis group, there were 67(67%) males and 33(33%) females. The difference in number of male and female subjects among both groups was not found to be statistically significant (p=0.902). In the psoriasis group, there were 86% patients with chronic plaque psoriasis, 5% patients with palmoplantar psoriasis and pustular psoriasis each, and 4% patients with guttate psoriasis. The control group comprised of 32% patients of dermatophytosis, 26% patients with pityriasis versicolor, 24% patients with viral warts and 18% patients with pityriasis rosea. Family history of psoriasis was present in 22% of psoriasis patients and 4% of controls (p=0.006). Comorbidities included diabetes (12% in psoriasis vs. 6% in controls, p=0.232), dyslipidemia (15% vs. 8%, p=0.196), and obesity (18% vs. 10%, p=0.182). Antihypertensive medication use was reported in 10% of psoriasis patients and 4% of controls (p=0.183). Hypertension (defined as SBP 140mm Hg or DBP 90mm Hg or use of anti-hypertensive medication) was observed in 18% of psoriasis patients compared to 6% of controls (p=0.048).

In the psoriasis group, 50(50%) of the patients had a disease duration of less than 10 years and an equal number of patients i.e., 50(50%) had a disease duration of more than 10 years. The severity of the disease was assessed using the Psoriasis Area and Severity Index (PASI) score. The overall mean PASI score of the patients was 16.96±13.9. There were 30(30%) patients in the mild group (PASI<7), 14(14%) patients in the moderate severity group (PASI 7-12) and 56(56%) patients were classified as suffering from severe disease (PASI>12).

Looking at the blood pressure measurements, the mean systolic blood pressure was 126±5 mm Hg in the diseased group and 122±4 mm Hg in the control group. The difference between both the groups was statistically significant (p=0.003). The diseased group had a mean diastolic blood pressure of 75±5 mm Hg whereas the control group had a mean diastolic blood pressure of 72±2 mm Hg. Again, the difference between both the groups was statistically significant (p<0.001).

The mean systolic blood pressure in patients with a disease duration of less than 10 years was 122±2 mm Hg and in patients with a disease duration of more than 10 years was 130 ±3 mm Hg. The difference between both the groups was statistically significant (p<0.001) (Table 2). A significant positive correlation was found between systolic blood pressure and the duration of the disease (p<0.001). On correlation analysis, a linear positive correlation was

found between the systolic blood pressure and the duration of the disease (Correlation co-efficient R^2=0.768) (Figure 1).

The mean diastolic blood pressure in patients with a disease duration of less than 10 years was 72±2 mm Hg and in patients with a disease duration of more than 10 years was 79±4 mm Hg. Again, the difference between both the groups was statistically significant (p<0.001) (Table 2). A significant positive correlation was found between diastolic blood pressure and the duration of the disease (p<0.001). On correlation analysis, a linear positive correlation was found between the diastolic blood pressure and the duration of the disease (Correlation co-efficient R^2=0.550) (Figure 2).

ANOVA analysis revealed significant differences in SBP across disease severity groups (p=0.011) (Table 3). Patients with mild disease had a mean systolic blood pressure of 124±4 mm Hg while this value was 125±5 mm Hg in patients with moderate disease and 127 ±5 mm Hg in those suffering from severe psoriasis. On comparing the groups amongst themselves (post-hoc turkey test), there was no significant difference between patients with mild and moderate disease (p=1.000) and those with moderate and severe disease (p=0.419). However, a significant statistical difference was noted between patients suffering from mild disease and those suffering from severe disease (p=0.007) in terms of systolic blood pressure (Table 4). A significant correlation (p<0.001) was found between the systolic blood pressure and the severity of the disease. On correlation analysis, a significant linear positive correlation was found between systolic blood pressure and the severity of the disease (R^2=0.196) (Figure 3).

Patients with mild disease had a mean diastolic blood pressure of 74±4 mm Hg while this value was 74 ±5 mm Hg in patients with moderate disease and 77±5 mm Hg in those suffering from severe psoriasis (Table 3). On comparing the groups amongst themselves, there was no significant difference between patients with mild and moderate disease (p=1.000), those with moderate and severe disease (p=0.276) and even in patients with mild and severe disease (p=0.056). A significant correlation (p<0.001) was found between the diastolic blood pressure and the severity of the disease. On correlation analysis, a significant linear positive correlation was found between diastolic blood pressure and the severity of the disease (R^2=0.119) (Figure 4).

Multivariate regression analysis (Table 5), adjusting for age, sex, diabetes, dyslipidemia, obesity, and anti-hypertensive use, confirmed that disease duration (β=0.512, p<0.001 for SBP; β=0.398, p<0.001 for DBP) and PASI score (β=0.231, p=0.012 for SBP; β=0.189, p=0.034 for DBP) were independent predictors of elevated blood pressure.

Discussion

Psoriasis is a common T cell mediated inflammatory and chronic disease which is characterized by hyper proliferation and loss of normal differentiation in the epidermis, vascular changes, and lymphocytic infiltration [10]. Systemic inflammation in psoriasis is associated with many cardiovascular unfavourable changes including: endothelial dysfunction, hypertension, increased platelet adhesion, and heart rate variability [11]. Patients with psoriasis have a shorter life expectancy, ascribed to be due to cardiovascular abnormalities in most cases [12]. Subclinical features of cardiovascular dysfunction are commonly found in patients of psoriasis, even in the absence of traditional cardiovascular risk factors [6].

In the present study, the mean systolic blood pressure was 126 ±5 mm Hg in the diseased group and 122±4 mm Hg in the control group. The difference between both the groups was statistically significant (p=0.003). Our findings are in line with those of Biyik et al. [13], Gill et al. [14] and Mohaseb AI et al. [15] who also reported a significantly higher systolic blood pressure in patients of psoriasis than healthy controls with a p-value of <0.001, 0.03 and 0.001 respectively. However, few other studies did not report a significantly higher blood pressure in patients of psoriasis [16-19]. This could be due to higher number of patients with severe disease (PASI>12) in the present study as treatment naïve patients were recruited for this study.

During the course of our study, we found a significant positive correlation between systolic blood pressure and the duration of the disease (R^2=0.768). Similar to our finding, Biyik et al. [13] also found a significant correlation of systolic blood pressure with duration of the disease. The present study also established a significant positive correlation of the systolic blood pressure with the PASI score (R^2=0.196). Mohaseb AI et al. also reported a positive correlation of the systolic blood pressure in psoriasis patients with PASI score (r=0.303) [15].

The mean diastolic blood pressure in the current study was 75 ±5 mm Hg in the diseased group and 72 ±2 mm Hg in the control group. The difference between both the groups was statistically significant (p<0.001). Our findings are in line with those of Biyik et al. [13] and Gill et al. [14], who also reported a significantly higher diastolic blood pressure in patients of psoriasis than healthy controls with a p-value of <0.001, 0.03 and 0.046 respectively. However, other studies did not report a significantly higher diastolic blood pressure in patients of psoriasis [15-24]. Again, the difference could be due to higher number of patients with severe disease (PASI>12) in the present study.

In the present study, a linear positive correlation was found between the diastolic blood pressure and the duration of the disease (R^2=0.550). As with the systolic blood pressure, Biyik et al. also found a significant correlation of diastolic blood pressure with duration of the

disease [13]. A significant linear positive correlation was found between diastolic blood pressure and the severity of the disease (R^2=0.196) in our study. Similar to our findings, Mohaseb AI et al also found a positive correlation of the diastolic blood pressure in psoriasis patients with PASI score (r=0.299) [15].

The precise cause of elevated blood pressure in psoriasis patients is not yet fully understood. Nonetheless, various pathogenetic mechanisms have been proposed in the literature. Firstly, the altered renin–angiotensin system, particularly the increased plasma renin activity and heightened angiotensin-converting enzyme activity, may significantly impact cytokine regulation in the vasculature of psoriasis patients [25]. Additionally, higher endothelin-1 levels might partly explain the elevated blood pressure observed in these individuals. Finally, increased oxidative stress in psoriasis patients may vitiate endothelial vasodilatory mechanisms [26]. This association between high blood pressure and psoriasis could also account for the presence of left ventricular diastolic dysfunction in these patients.

This study provides novel insights by demonstrating a significant correlation between psoriasis severity (measured by PASI) and both systolic and diastolic blood pressure, independent of traditional risk factors like age, sex, and comorbidities. Unlike many prior studies, we included treatment-naïve patients, which may explain the stronger association observed. Additionally, the use of multivariate regression analysis strengthens the evidence that disease duration and severity independently contribute to the elevated blood pressure, highlighting the importance of early cardiovascular screening in psoriasis patients.**Conclusions**

Psoriasis is linked to elevated blood pressure, with the risk being significantly higher in patients experiencing severe symptoms or having a longer disease duration. It is imperative to incorporate cardiovascular history taking and physical examinations, including routine blood pressure measurements, into consultations and follow-up appointments for psoriasis patients. Early detection of subclinical cardiovascular disease in individuals with psoriasis can lead to more rigorous monitoring and timely intervention, potentially enhancing cardiovascular outcomes.

Limitations

1. Long term follow up of the patients was not a part of the study.
2. Effects of various drugs used for psoriasis on blood pressure changes could not be evaluated.

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Table 1. Demographic and clinical characteristics of study subjects.

Characteristic	Psoriasis (n=100)	Controls (n=50)	p-value
Age (years, mean±SD)	45±13	45±15	0.118
Male, n (%)	67 (67%)	34 (68%)	0.902
Family history of psoriasis, n (%)	22 (22%)	2 (4%)	0006
Diabetes, n (%)	12 (12%)	3 (6%)	0.232
Dyslipidemia, n (%)	15 (15%)	4 (8%)	0.196
Obesity, n (%)	18 (18%)	5 (10%)	0.182
Antihypertensive use, n (%)	10 (10%)	2 (4%)	0.183
Hypertension, n(%)	18 (18%)	3 (6%)	0.048

Table 2. Comparison of blood pressure measurements by disease duration.

Blood Pressure	Duration<10 years (n=50)	Duration>10 years (n=50)	p-value
SBP (mm Hg, mean±SD)	122±2	130±3	<0.001
DBP (mm Hg, mean±SD)	72±2	79±4	<0.001

Table 3. Blood pressure analysis by disease severity.

Blood Pressure	Mild (n=30)	Moderate (n=14)	Severe (n=56)	p-value (ANOVA)
SBP (mm Hg, mean±SD)	124±4	125±5	127±5	0.011
DBP (mm Hg, mean±SD)	74±4	74±5	77±5	0.076

Table 4. Post-hoc Turkey test for systolic blood pressure across severity groups.

Comparison	Mean difference	Standard error	p-value
Mild vs. Moderate	-1.438	1.740	1.000
Mild vs. Severe	-3.831	1.217	0.007
Moderate vs. Severe	-2.393	1.607	0.419

Table 5. Multivariate regression analysis for blood pressure.

Variable	SBP (β, p-value)	DBP (β, p-value)
Disease duration	0.512, <0.001	0.398, <0.001
PASI score	0.231, 0.012	0.189, 0.034
Age	0.102, 0.156	0.089, 0.204
Sex	0.045, 0.512	0.032, 0.623
Diabetes	0.078, 0.289	0.065, 0.356
Dyslipidemia	0.092, 0.198	0.071, 0.301
Obesity	0.110, 0.134	0.095, 0.178
Anti-hypertensive use	0.067, 0.0342	0.058, 0.401

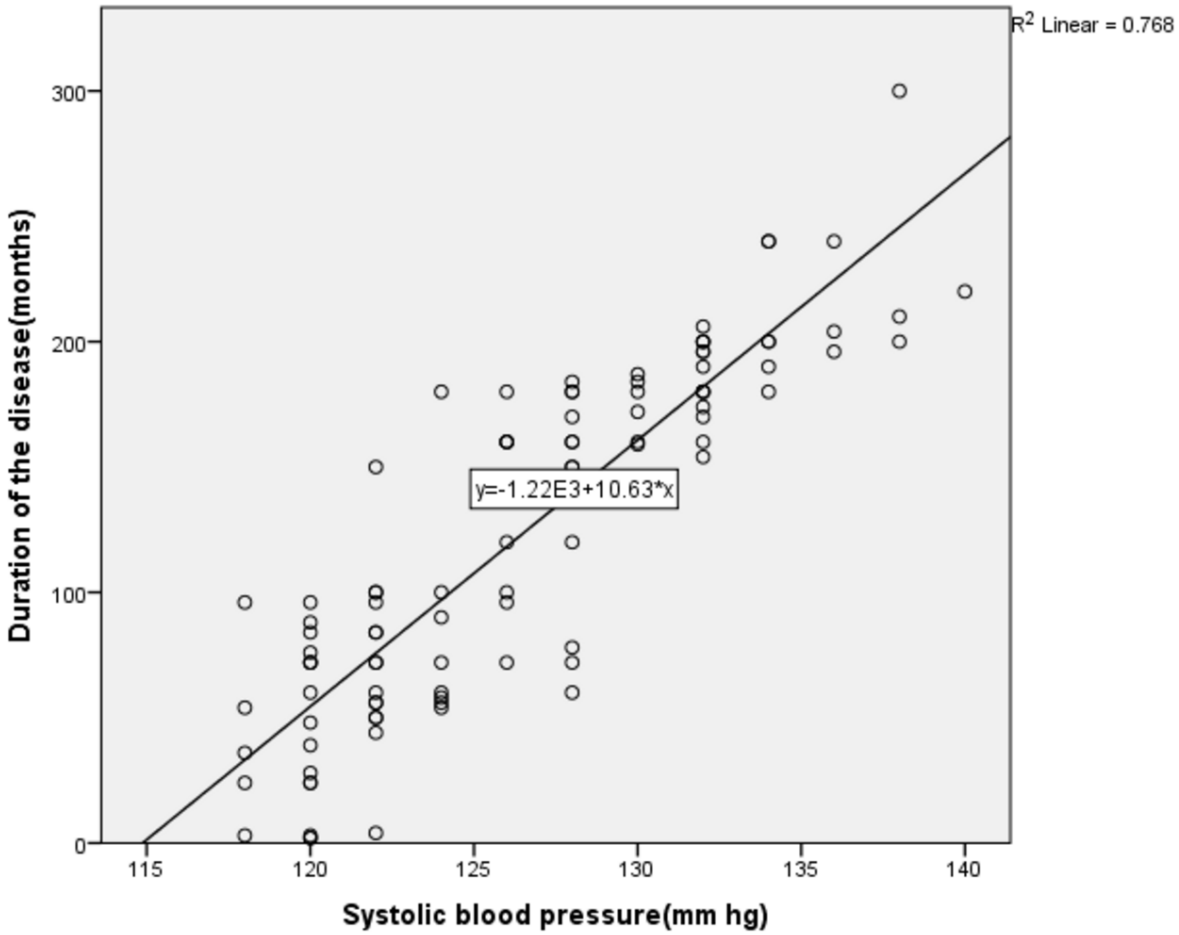

Figure 1. Correlation analysis of systolic blood pressure with duration of the disease.

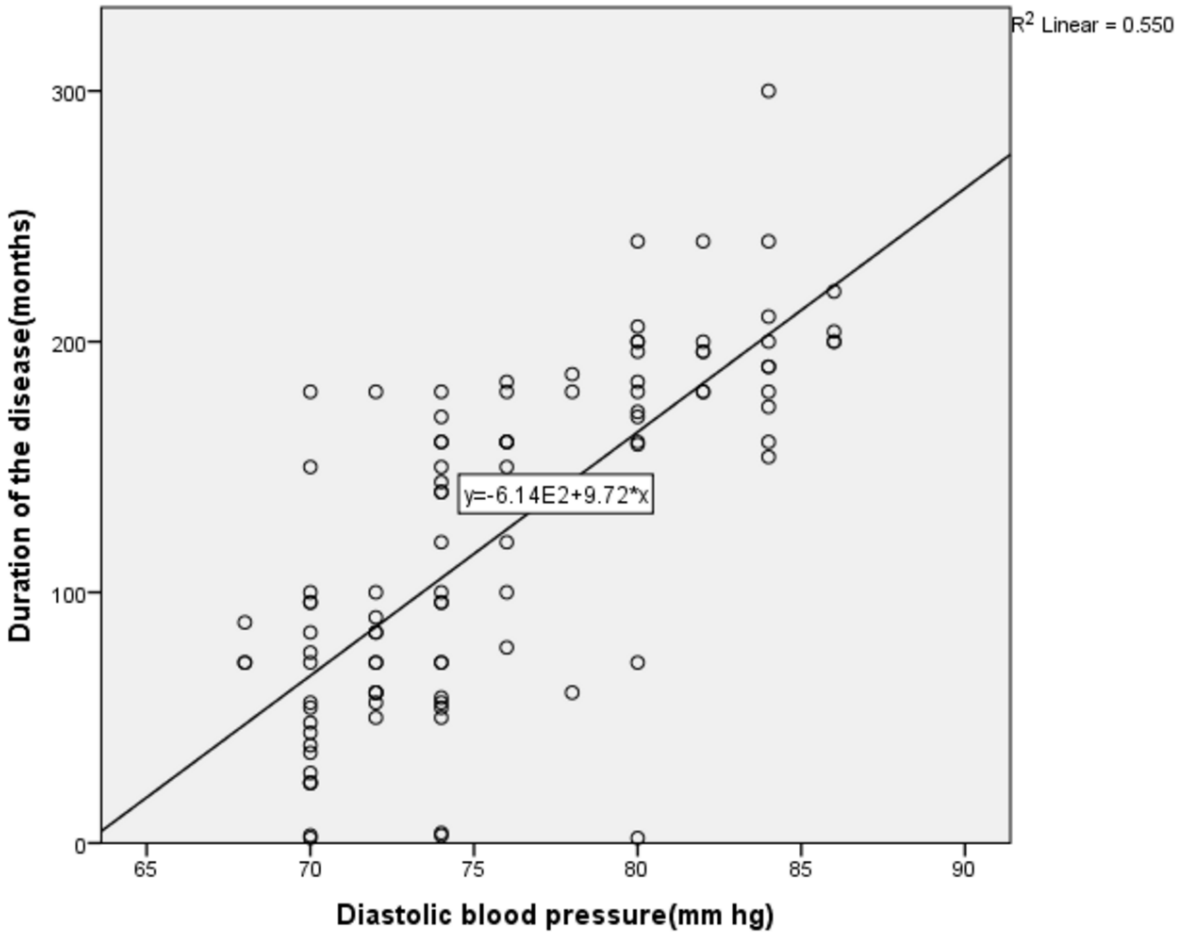

Figure 2. Correlation analysis of diastolic blood pressure with duration of the disease.

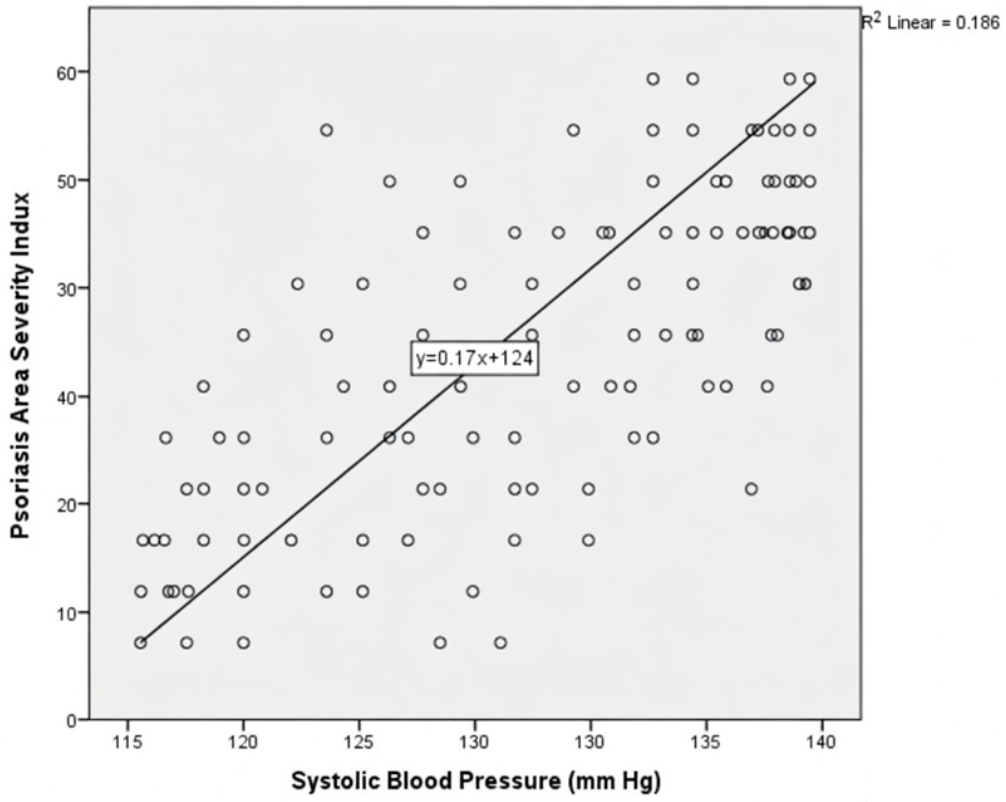

Figure 3. Correlation analysis between systolic blood pressure and psoriasis area severity index.

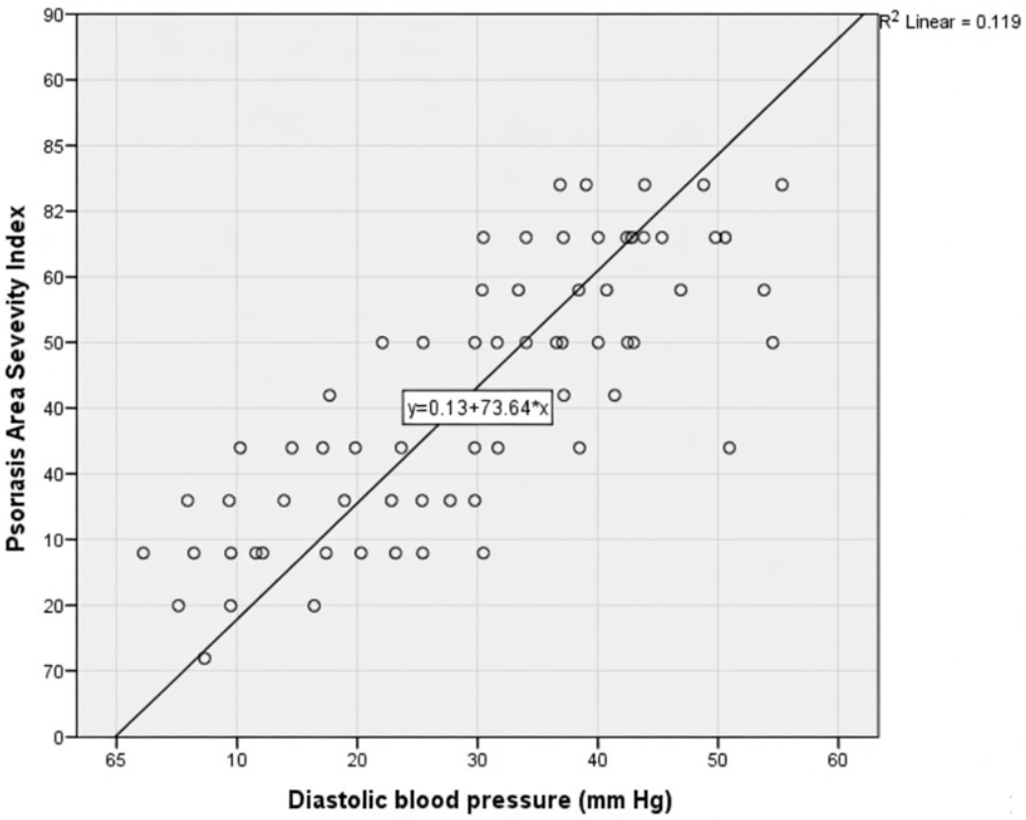

Figure 4. Correlation between diastolic blood pressure and severity of the disease.