

## **Expression of Nerve Growth Factor (NGF) and its receptor (TrKA) in chronic renal failure patients with pruritus**

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### **Introduction & Objectives**

Chronic renal failure (CRF) is a progressive loss in renal function over a period of months or years. It is differentiated from acute kidney disease in that the reduction in kidney function must be present for over 3 months. In Egypt; end stage renal disease (ESRD) is growing by 100% annually; the estimated annual incidence of ESRD is around 74 per million and the total prevalence of patients on dialysis is 264 per million, also there are 90,000 patient die each year because of kidney failure. Uremic pruritus is the most common cutaneous abnormality in patients with CRF. In Egyptian patients with CRF on hemodialysis the prevalence of pruritus was 55%. Nerve growth factor is a neurotropic polypeptide necessary for the survival and growth of some central neurons, as well as sensory afferent and sympathetic neurons. The aim of this study was to investigate the expressions of Nerve growth factor (NGF) and its receptor (TrKA) in CRF patients with pruritus on hemodialysis and correlated the pattern of expressions with an itch score.

### **Materials & Methods**

A case-control study was carried out on 30 patients with CRF and uremic pruritus on hemodialysis who were treated at Sohag Educational Hospital, Sohag, Egypt and 20 healthy control subjects. It was conducted over a period of 2 years from May 2014 to May 2016. Severity of itching was measured by the 5-D itch score. Skin punch biopsy (5 mm) was taken from patients and controls. These samples were treated and processed for immunohistochemical detection of NGF and its receptor (TrKA).

### **Results**

The present study found that in the skin of the healthy control participants the expressions of NGF were seen in the epidermal basal layer, but there was no expression in upper and mid epidermal cell layers ( **Fig 1-a** ) while in dermis

about 75% of them showed mild expression and 25% showed moderate expression ( **Fig 2-a** ).

In patients with chronic CRF with pruritus on dialysis the expressions of NGF were strong in epidermal basal layers, upper and mid epidermal layers (**Fig 1-b, c, d**). There was a strong expression of NGF in dermis with some spindle like infiltrating cells especially in dermal papillae (**Fig 2- b, c, d**).

The present study found that in the skin of the healthy control participants the expression of TrKA were seen in the epidermal basal layer, but there was no expression in upper and mid epidermal cell layers( **Fig 3-a** ) while in dermis 75% of them showed mild expression while 25% showed moderate expression( **Fig 4-a** ).

In patients with chronic CRF with pruritus on dialysis the expressions of TrKA were strong in epidermal basal layers, mid and upper epidermal layers (**Fig 3-b, c, d**). In dermis especially upper dermis larger number of cells demonstrated strong TrKA immunoreactivity (**Fig 4-b, c, d**).

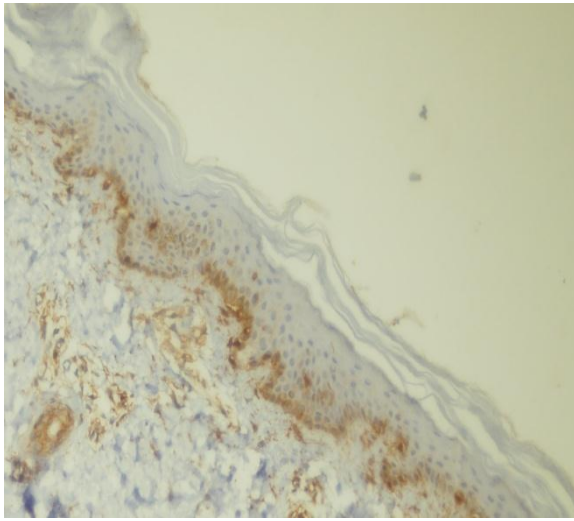
There was no statistically significant difference between NGF and TrKA expression in patients with CRF with pruritus.

This study found that there was a significant correlation between the 5-D itch score and age of the patients (**Fig 5**). There was a significant correlation between the 5-D itch score and degree of expression of both NGF and TrKA

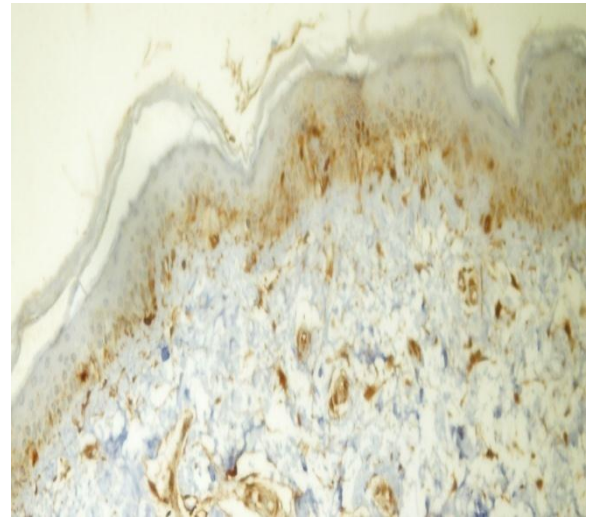
(**Fig 6, 7**).

### **Conclusions**

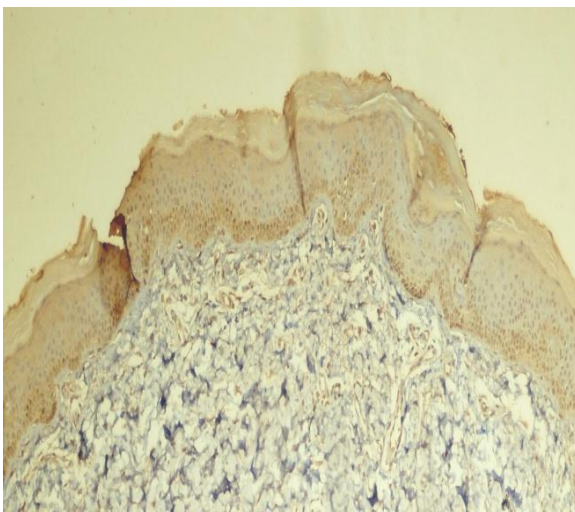
According to the results of this study, expressions of NGF and TrKA could be the cause of initiation and maintenance of pruritus in CRF patients with pruritus on dialysis.



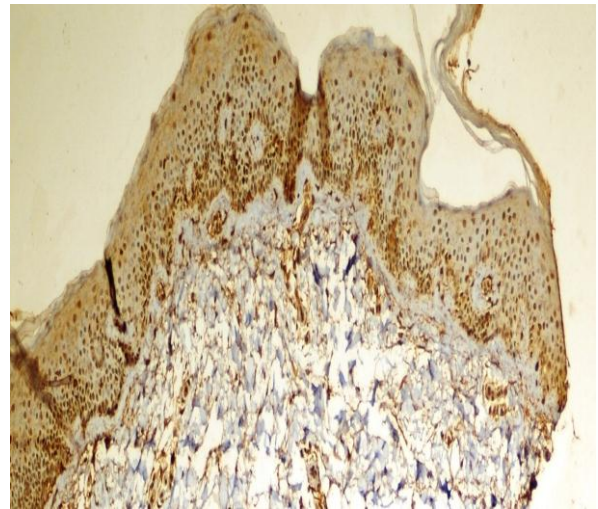
(a)



(b)



(c)



(d)

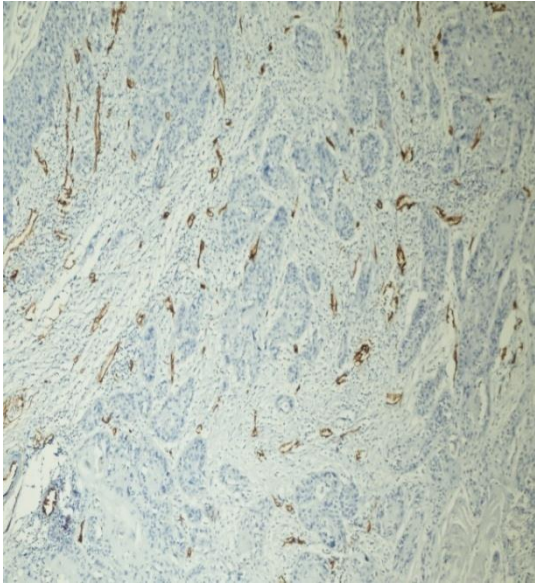
**Figure (1) NGF expressions in the epidermis:**

(a) Expressions of NGF in control.

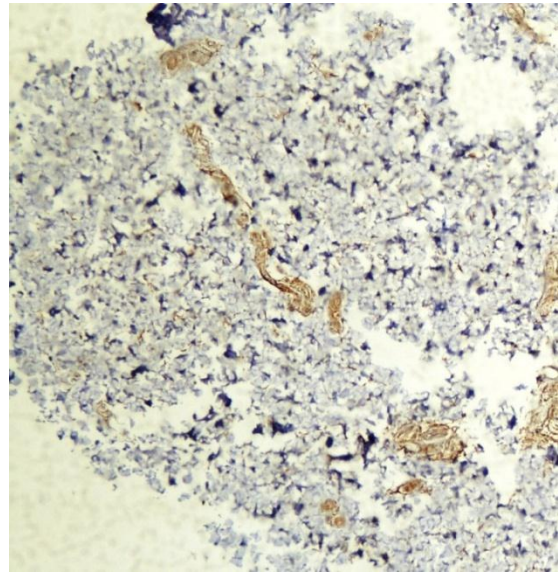
(b) Weak expressions of NGF in CRF patients.

(c) Moderate expressions of NGF in CRF patients.

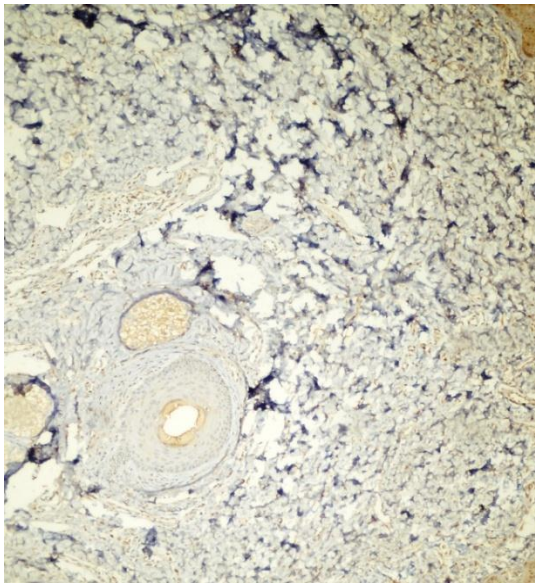
(d) Strong expressions of NGF in CRF patients.



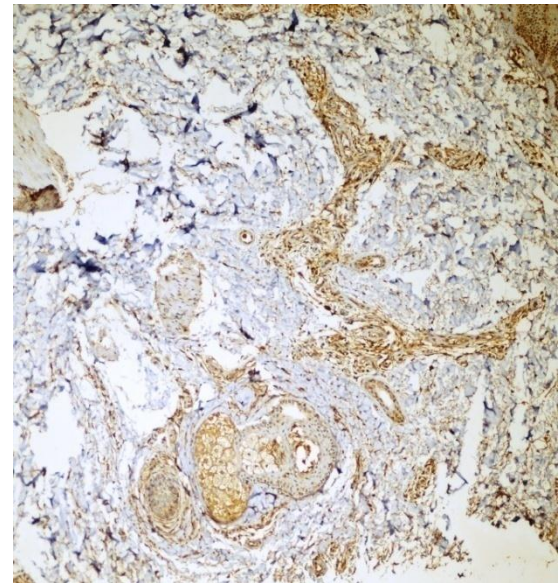
(a)



(b)



(c)



(d)

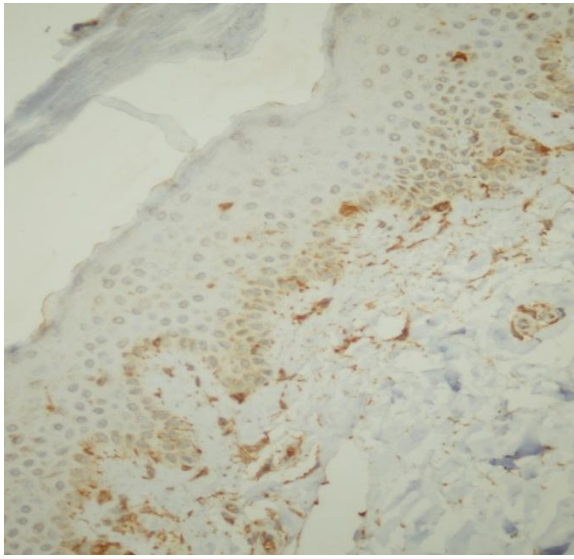
**Figure (2) Expressions of NGF in the dermis:**

(a) NGF expressions in control.

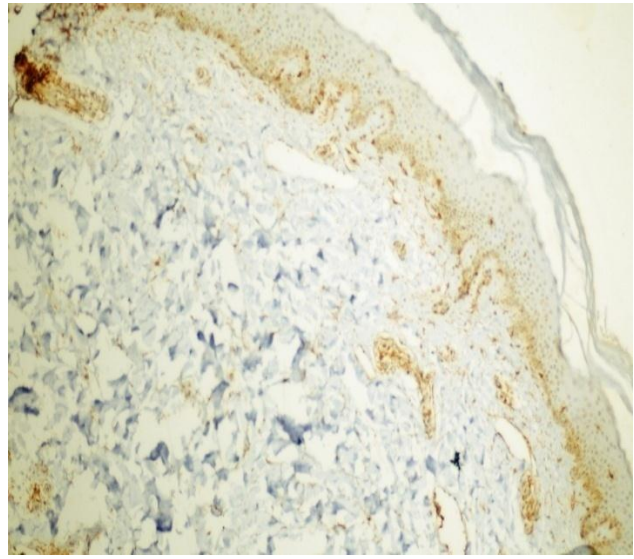
(b) Mild expressions of NGF in CRF patients.

(c) Moderate expressions of NGF in CRF patients.

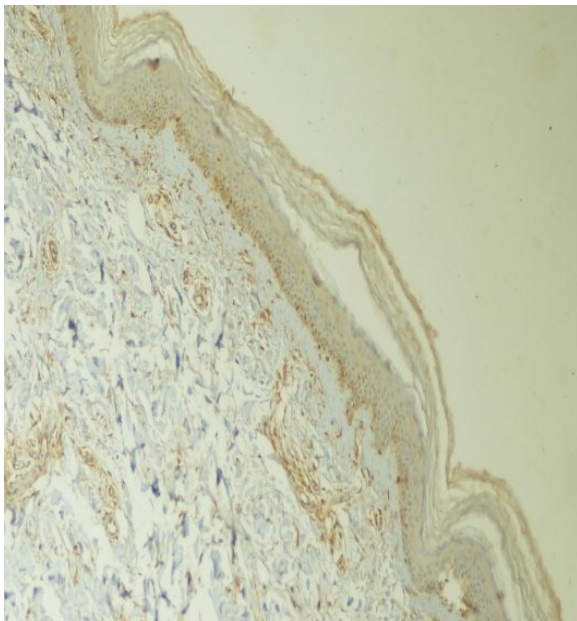
(d) Strong expressions of NGF in CRF patients.



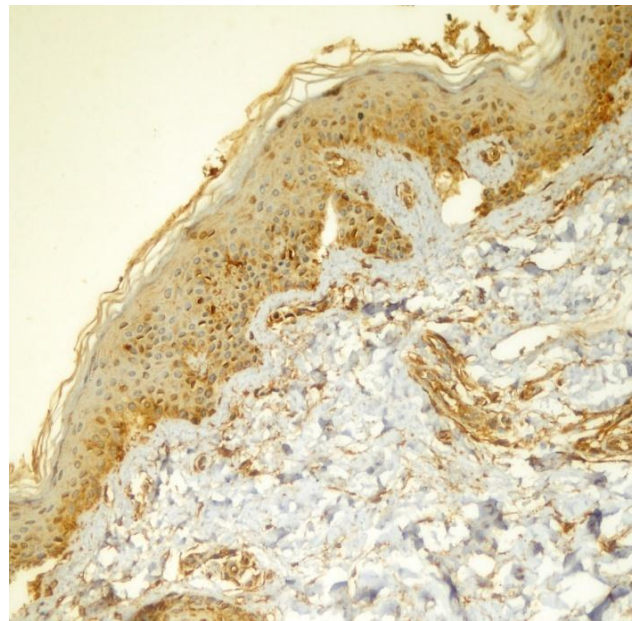
(a)



(b)



(c)



(d)

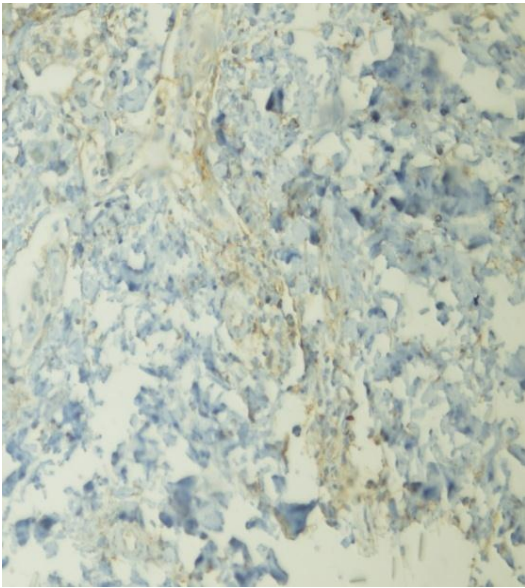
**Figure (3) Expressions of TrKA in epidermis:**

(a) TrKA expressions in control.

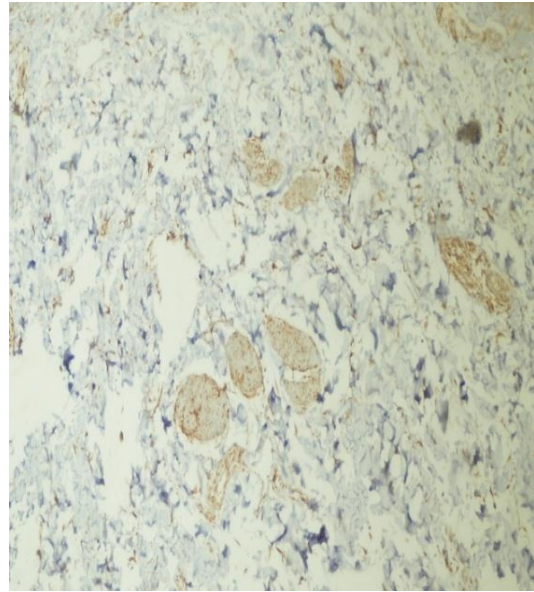
(b) Mild TrKA expressions in CRF patients.

(c) Moderate TrKA expressions in CRF patients.

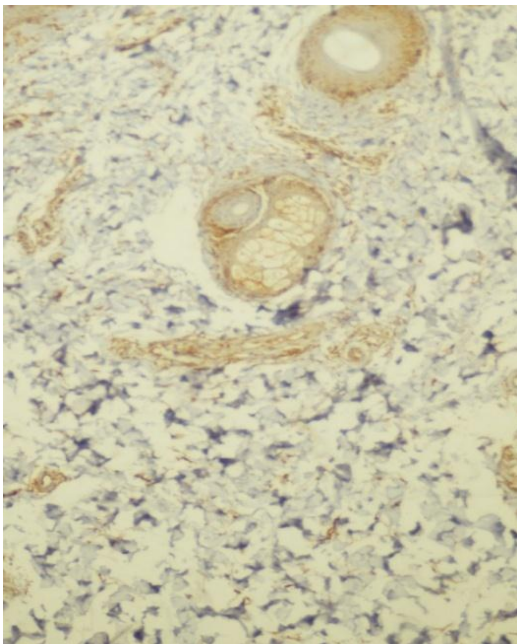
(d) Strong TrKA expression in CRF patients.



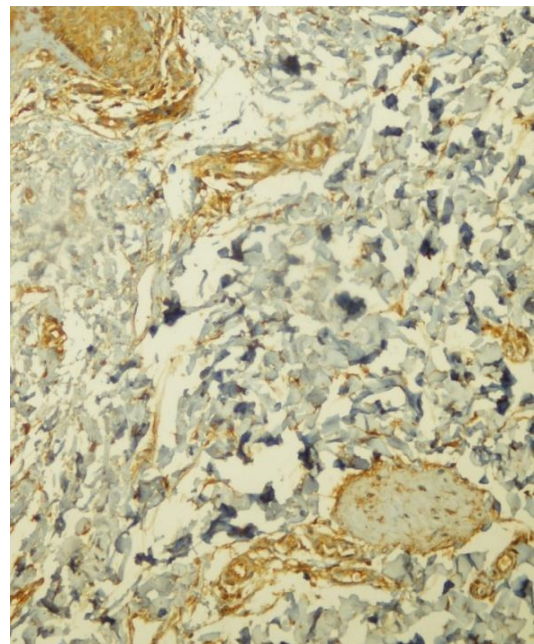
(a)



(b)



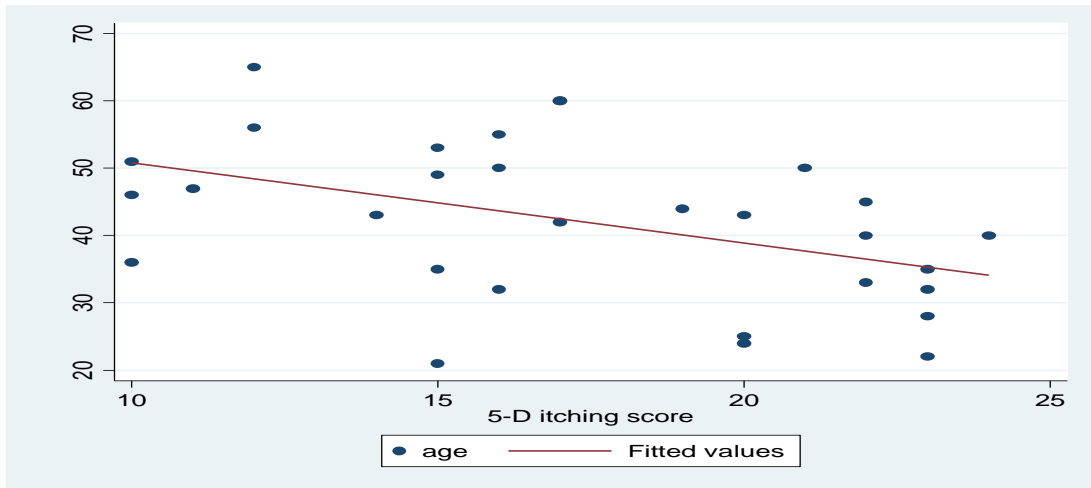
(c)



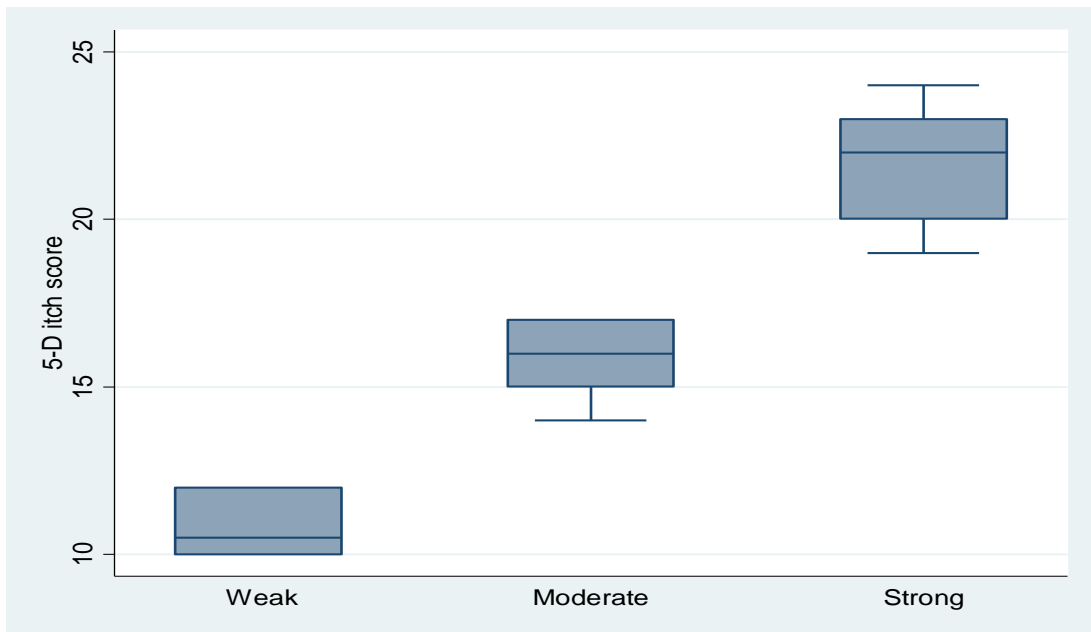
(d)

**Figure (4) Expressions of TrKA in dermis:**

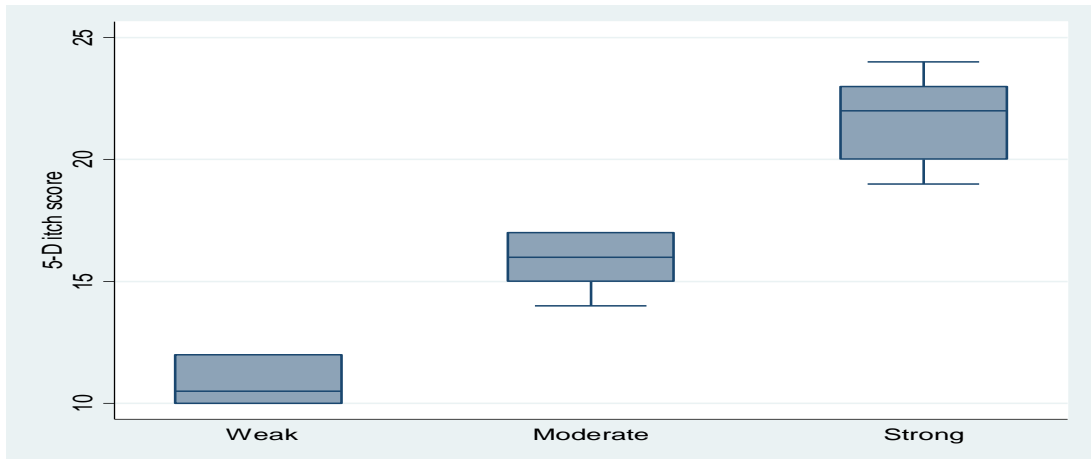
- (a) Expressions of TrKA in control.
- (b) Mild expressions of TrKA in CRF patients.
- (c) Moderate expressions of TrKA in CRF patients.
- (d) Strong expressions of TrKA in CRF patients.



**Figure (5)** Scatter diagram showing correlation between 5-D itching score and age.



**Figure (6)** Relation between expression of NGF and 5-D itching score.



**Figure (7)** Relation between expression of TrKA and 5-D itching score.