

## Original Article

### Serum prolactin level in healthy Sudanese subjects

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#### Abstract

##### Background

Prolactin (PRL) level is commonly estimated in patients with amenorrhoea, infertility and suspected hyperprolactinemia. Only one study that included 15 Sudanese females was done in Sudan to establish a normal level of PRL in Sudanese subjects.

The objectives of the study were:

1. To develop a local antibody for PRL to be used in PRL radio-immunoassay (RIA) to reduce the cost of the investigation.
2. To determine normal PRL level in Sudanese females and males.

##### Method

Prolactin was determined in one hundred normal Sudanese males and one hundred females using the Chinese Radio Immunoassay kit with the locally produced Donkey Anti Rabbit's Sera (Sud-DARS) as separating agent.

##### Results

PRL level in normal Sudanese males was found to be  $236 \pm 81$  mIU/L (mean $\pm$ SD). In Sudanese females the PRL level in preovulatory phase was found to be  $258 \pm 78$  mIU/L while in postovulatory phase was found to be equal to  $278 \pm 82$  mIU/L.

Ovulation was confirmed by measurement of progesterone levels seven days before the next suspected menstruation.

**Conclusion** Prolactin level in normal Sudanese females and males were reported. This level was similar to levels reported in the literature.

**Keywords:** amenorrhoea, ovulation, pituitary, dopamine

##### Introduction

PRL is a protein hormone secreted by lactotrope cells in the anterior pituitary.

PRL secretion is controlled by the hypothalamus. It releases a PRL inhibitory factor which is dopamine, the dopaminergic neuron cell bodies found in the medial-basal hypothalamus. Dopamine directly stimulates the dopaminergic receptor on the lactotrope and inhibits PRL secretion<sup>(1)</sup>. During lactation, a PRL-releasing factor is released intermittently at the time of nursing, causing the surge in PRL secretion that occurs at that time. There is no evidence that plasma PRL concentration changes significantly during the menstrual cycle<sup>(2)</sup>. Vazquez and his group found seasonal differences in the PRL levels in the laboratory rats with higher values during spring and fall<sup>(3)</sup>.

The main action of PRL in man is on the mammary glands to induce synthesis of milk proteins<sup>(4)</sup>. However, more biological functions have been attributed to this hormone recently. They are classified into

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five classes: reproduction, endocrinology and metabolism, regulation of water and electrolytes balance, growth and development, brain and behavior and lastly immuno-regulation and protection<sup>(5,6)</sup>.

PRL levels in Sudanese females were estimated by Elsheikh et al. They measured PRL level in 15 normal females. They reported that the mean level of PRL in pre-ovulatory phase was  $335 \pm 15.1$  mIU/L and in the postovulatory phase was  $350 \pm 15.1$  mIU/L (mean  $\pm$  SEM) these levels are similar to those reported in the literature<sup>(7)</sup>.

Pathological hyperprolactinemia is defined as PRL levels more than the normal ranges other than in normal physiological conditions such as pregnancy and lactation. High levels of PRL affect the reproduction function. A high incidence of hyperprolactinemia among Sudanese infertile women and a relatively high incidence among Sudanese males have been reported by Siddig in 1992. That study included 161 females and 69 males. Hyperprolactinaemia was found to be the main cause of amenorrhea among 33% of Sudanese amenorrheic women<sup>(8)</sup>. This incidence of hyperprolactinemia in Sudan is similar to that reported in the literature<sup>(9)</sup>. Hyperprolactinemia produces an-ovulation because it prevents the leutinizing hormone (LH) plusatility and interferes with the positive feedback action of estradiol at the hypothalamic level through blockage of the estrogenic receptors<sup>(2,10)</sup>.

Hyperprolactinemia in males may reduce sperm count<sup>(11)</sup>. It was reported that significantly higher levels of PRL in the seminal plasma of individuals with a low sperm count is associated with decreased sperm motility and poor penetration in zona-free hamster ovum test. This indicates that PRL may have a negative effect on the functional capacity of spermatozoa<sup>(12)</sup>.

Interestingly, Zligang et al in 1997 found that PRL concentration in 32 patients who have Schizophrenia is higher than normal control group<sup>(13)</sup>.

Recently, PRL was found to stimulate the growth of mammary and prostate tumors<sup>(5)</sup>. Also the involvement of PRL in autoimmune diseases has been suggested<sup>(5,14)</sup>.

The objective of this study is to establish a normal serum PRL level for Sudanese males and females using locally produced Donkey Anti-Rabbit Sera (Sud-DARS) as separating agent.

## Subjects and Methods

### Subjects

The subjects were divided into two groups. The first group consisted of randomly selected 100 healthy Sudanese males aged 30 to 40 years. 5 ml of venous blood was collected from each subject in this group.

In the second group 100 healthy and normal Sudanese females their ages ranging from 24 to 40 years who were regular menstruating for the last three months were randomly selected. Four samples of 5 ml of venous blood were collected from each subject. Sample one was collected on day 7 of the menstruation to represent the preovulatory phase. Samples 2, 3 and 4 were collected at the 7th day  $\pm$  one day from the next expected menstruation to represent the postovulatory phase. Blood samples were allowed to stand for two hours at room temperature then centrifuged to obtain sera. The obtained sera was kept at  $-20^{\circ}\text{C}$  for hormonal analysis. Blood samples for PRL estimation were taken at least two hours after waking in order to avoid the expected increase in PRL level during sleep<sup>(2)</sup>.

Laboratory measurement of PRL and progesterone:

PRL was estimated using a radioimmunoassay (RIA) kit (IMK-482

China). The Chinese separating agent was replaced by the locally produced Sud-DARS.

Progesterone was measured by RIA kit (IMK-458 China).

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS).

### Results

The standard curve of RIA assay for human PRL using the Chinese kit showed a binding percentage equal to 35% (Fig 1) and when the Chinese separating agent was replaced by liquid Sud-DARS, the binding percentage was improved to 40% (Fig 2). A good displacement was obtained in both assays and there was no significant difference between the two assays

The precision profile was constructed by plotting Coefficient of Variation percent (C. V.%) against the PRL concentration, C. V. % of less than 15% was considered as the working range and as shown in Figure 2. This range is compatible with the normal range in addition to the pathological range of hyperprolactinemia<sup>(15)</sup>. The result obtained on testing Sud-DARS and the Chinese kit

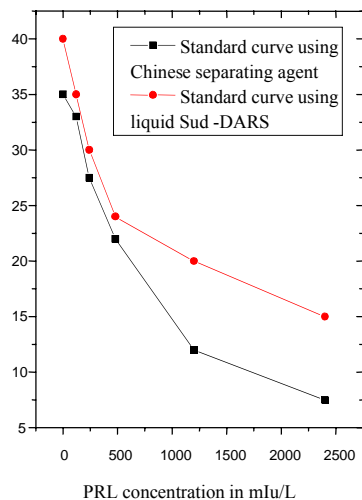
separating agent showed a very high compatibility (Fig. 2).

The minimum obtained level of PRL in normal males was 60 mIU/L and the maximum was 370 mIU/L. The PRL level was found to be  $236 \pm 81$  mIU/L (Fig 3).

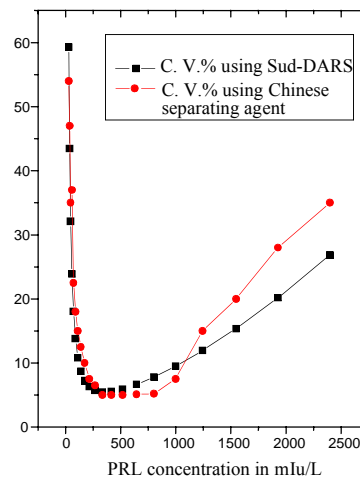
The serum PRL level in the pre-ovulatory phase (at day 7 after menstruation) was  $258 \pm 81$  mIU/L (Fig 4). The lowest value obtained was found to be 89 mIU/L while the highest one was equal to 540 mIU/L.

The level of serum PRL in the post-ovulatory phase (at day 7 before the next expected menstruation) was found to be equal to  $278 \pm 82$  mIU/L (Fig 4). The minimum obtained level was found to be 170 mIU/L while the maximum value was equal to 575 mIU/L. There was no significant difference in the PRL concentration in pre and post ovulatory phases.

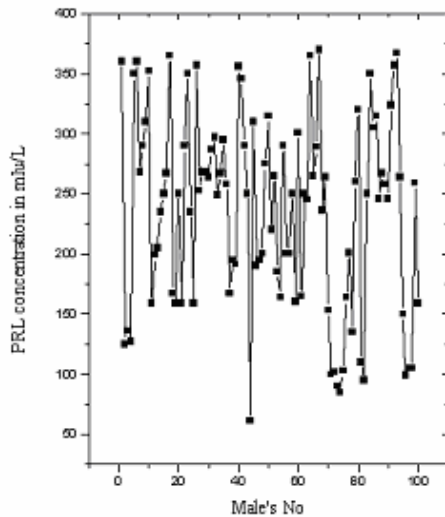
Ovulation was suggested by measuring progesterone level in samples collected 7 days before the next menstruation. All samples showed normal values of progesterone that is more than 20 nmoL/l, according to the Kit used.



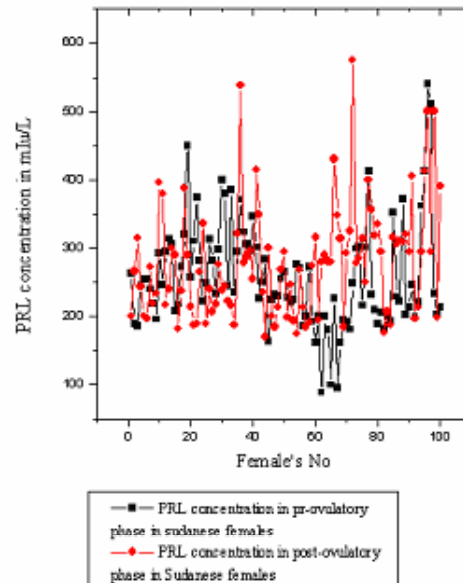
**Fig. 1:** The standard curves of PRL assays using different separating agents



**Fig. 2:** The precision profiles of PRL assays using different separating agents C.V.% (Coefficient Variation)



**Fig. 3:** Prolactin levels among normal Sudanese males



**Fig. 4:** Prolactin levels among normal Sudanese females

### Discussion

Diagnosis of infertility for the last decades is done using commercial kits which are very expensive and imported under special condition regarding transport and storage. Local production of these kits will minimize the cost of investigations and make them more available. This is why radioimmunoassay (RIA) laboratory in Sudan Atomic Energy Commission adopted a policy to promote local production of different antibodies since they are the critical components in RIA.

This study was preceded by another project in which a donkey anti-rabbit sera was raised (Sud-DARS). This Sud- DARS was to be used as a separating second antibody to replace that purchased with the Chinese kit which is routinely used to measure PRL in the National Central main

radioimmunoassay laboratory. An almost identical result was obtained when comparing the result obtained by the locally produced and the Chinese imported reagent (Fig. 1 and 2).

The mean serum PRL level in Sudanese males was found to be  $236 \pm 81$  mIU/L (Fig. 3). There was no previous report on PRL level in Sudanese males. This level was not different from that reported in the literature<sup>(8)</sup>.

The mean serum PRL in the pre-ovulatory phase (at day 7 of the menstruation) was  $258 \pm 78$  mIU/L (Figure 4).

The mean serum PRL in the post-ovulatory phase (at day 7 before the next menstruation) was found to be equal to  $278 \pm 82$  mIU/L (Fig 4). Three samples were taken in this phase, as it was difficult to decide on the 7th day before the next cycle.

One sample was collected on the calculated expected day and one before and after then the proper sample was selected after the next cycle. Normal Progesterone level was used as indicator of this phase. The level of PRL in the post ovulatory phase showed that 48 in females their level was slightly higher in the post ovulatory phase, 48 their levels were slightly lower and 2 remained the

same. There was no significant difference in the mean PRL concentration in pre and post ovulatory phases.

In conclusion Mean PRL levels in Sudanese subjects were found to be similar to that reported in the literature and within the normal range recommended when using the Chinese kit.

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