

# The Prevalence of Hormonal Imbalance Among Namibian Women

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## Research Article

**Keywords:** Female, infertility, hormonal imbalance, prevalence, Women

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# **The prevalence of hormonal imbalance among Namibian women**

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## **Abstract**

*Purpose:* Infertility is a complex disorder with significant medical, psychosocial and economic aspects recognized as a public health issue. This study aims to investigate the prevalence of hormonal imbalance in Namibian women.

*Methods:* This was a retrospective study, analysing female hormonal data from 2015 to 2019 after obtaining ethical approval from the Namibia University of Science and Technology, the Ministry of Health and Social Services and the Namibia Institute of Pathology. The medical data received from NIP were acquired from women aged 16 to 60 years from different hospital wards nationwide.

*Results:* Results indicated a high prevalence (21.1 %) of hormonal imbalance among Namibian women. An average of 47% of the patients experienced critically high or low thyroid hormone values. The prevalence of imbalanced reproductive hormones was 21.1% of which approximately 20% was contributed by progesterone.

*Conclusion:* Based on the statistical analysis it can be concluded that the prevalence of hormonal imbalance in Namibian women is significantly high and alarming. The general population of Namibian women have a high risk in developing conditions linked to hormonal imbalance. To better understand the implications of these results further studies should be conducted.

**Keywords:** Female, infertility; hormonal imbalance; prevalence, Women

## **Introduction**

Hormones are chemical messengers released by particular secretory cells in endocrine glands and are transported via the circulation to target cells where they have a biological effect. Once a woman enters her reproductive years, she begins to release a least one egg monthly. The development and release of the egg is dependent on the delicate balance of hormones. Some of which are produced in the ovaries, others from the hypothalamus and the pituitary gland. Hormonal imbalance is defined as the excess or

deficient secretion of one or more hormones in the body. Hormonal irregularities are essential in the diagnosis of female infertility [1].

The global community is very much focused on reproductive health as a measure to identify prevention and treatment efforts. The pattern of infertility prevalence is high in West, Central and Southern African countries [2]. Five countries in southern Africa regions have less than 4 children: South Africa (2.1), Lesotho (3.3), Swaziland (3.8) and Namibia (3.6) [4]. In addition, the increasing use of contraceptives in developing countries plays a key role. The highest percentage was recorded in South Africa (60%), Zimbabwe (50%) and Namibia (43%). During 2006-2011 these numbers increased in Zimbabwe (57%) and Namibia (53%) [4]. Studies show interrelationship between obesity hypothyroidism due to low gastric secretion, impairment of LH and FSH concentrations, ovulatory dysfunction, prolactin secretion dysfunction, abnormalities of the reproductive system [3] and women infertility [5-8]. Thyroxicosis results in increased serum levels of SHBG also, oestrogen levels may be 2 to 3-fold higher in hyperthyroid women during all phases of the menstrual cycle [9]. Hyperprolactinemia inhibits GnRH secretion, and impact menstrual irregularities [10,11], prolactin can act directly on GnRH neurons to suppress GnRH secretion or other metabolic factors contributing to the secretion of pulsatile GnRH and LH [12]. Hormonal fluctuations have a significant effect on the brain. low levels of oestrogen and progesterone induce memory deficits[13]. Infertility is emotionally straining to both partners in the relationship and can lead to depression and suicidal action if it not properly managed [14, 15].

## **Materials and method**

### **Research design**

This was a retrospective study, analysing female hormone data and medical records from the year 2015 to 2019. Therefore, a waiver of consent was obtained from the Ministry of Health and Social Services legal custodian of the data after approval by the ethics committee of the same Ministry. The medical hormonal data received from NIP were acquired from women aged 16 to 60 years from different hospital wards nationwide. Data were analysed the by the authors of the manuscript.

### **Ethical considerations**

Ethical approval was obtained from the Namibia University of Science and Technology, the Namibia Institute of Pathology and the Ministry of Health and Social Services and the ethics committees. Ethical clearance number *PVM 2020*), To guarantee confidentiality and privacy of patient records, only the researcher and research supervisor had access to the patient records. All methods were performed in accordance with the relevant guidelines and regulations.

### **Study population**

The study population included female subjects between the ages of 16-60 who were screened for the female infertility panel of immunochemistry tests at NIP from the year 2015-2019, who visited multiple hospitals and medical practices in Namibia.

### **Sample size**

The following formula used to calculate the sample size;  $N = z^2pq/d$ . Where N = sample size, z = standard normal deviate usually set at 1.96 at 95% confidence level, p = study population assuming the maximum variability, the study population is equal to 50% (p = 0.5), q = 1-p (1-0.5 = 0.5), d = desired degree of accuracy usually set at 0.05. A total of 130 825 test results were analysed in this study.

### **Methods of data analysis**

Quantitative data analysis of hormone levels obtained from NIP database were imported into a Microsoft Excel spreadsheet. The data was validated first to ensure that it is collected as per research criteria. Incomplete or bias data was excluded from the study. Data was analysed with IBM SPSS Statistics 26 software through which the results of each hormone was used to determine the prevalence of hormonal imbalance. The data was then arranged according to age categories and location. The prevalence was calculated as a measure of frequency and results generated from the study were summarized into tables.

### **Results**

This study included a total of 130 825 test results generated from the study population. The study referred to the reference ranges used by the NIP. The study population is characterised into age groups; 16-25 (reproductive), 26-35 (highly reproductive), 36-45 (premenopausal) and 46-60 (menopausal). No significant hormonal variation occurs in women beyond the age of 60 thus, the population study cut-off point is 60 years of age.

There were 29 372 patients analysed for thyroid function tests (TFT) during the study period. From the study population 13 816 (47.0%) of women were recorded with TFT values above and or below the reference range specific to each hormone. There were 101 480 patients that were tested for reproductive hormones during the study period. From the study population 30 550 (30.1%) of women were recorded with reproductive hormone values above and or below the reference range specific to each hormone (Table 1).

TSH levels remain consistent among all age groups; a large percentage (85.7%) of the study population recorded TSH values within the set reference range. Whereas less than 10% recorded high and low TSH values respectively (Table 2).

From Table 3, an average of 82.9% of T<sub>3</sub> levels are largely within the reference range of 2.52-5.35 pmol/L across all age groups. However, 11.10% of the study population recorded high Whereas 6 % of the study population recorded low T<sub>3</sub> values. T<sub>4</sub> levels remain consistent among all age groups; 100% of the study population recorded values within the reference range of 9.01-19.05 pmol/L.

Majority of FSH values are within the reference range of 1.79-22.51 mIU/L with the exception of the study population ages 45-60 in which less than 50% recorded values within range. Whereas 9.2% and 10.5 % of the study population recorded low and higher FSH values respectively. LH levels are mainly within the reference range of 0.4-105 mIU/L. However, 1.5% of the study population aged 16-25 representing 0.4% of the total participants recorded low LH values (Table 4).

From Table 5, the majority of E<sub>2</sub> values remain within the reference range of 37-184 pg/mL representing an estimate 60% of the study population. However, 60.3 % of the study population aged 46-60 recorded values below the reference range. Whereas 11.2% of the total population recorded values above range. Progesterone values were significantly low among all age groups; 100% of the study population aged 16-25 and 46-60 recorded low progesterone values. The exception of the 26-35 age group which largely recorded values within the reference range of 0.86-122.84 nmol/L. Only 2% of the population recorded high progesterone values. On average prolactin values were within the reference range of 33.4-580.0 mIU/L. About 10% and less of the study population recorded values above or below the reference range.

$$\text{Prevalence} = \frac{\text{no of existing cases of hormone imbalance}}{\text{no of people in the population}} \text{(Gerstman, 2013)}$$

$$\text{Prevalence} = \frac{\text{TFT imbalance+reproductive hormone imbalance}}{\text{total study population}}$$

$$\text{Prevalence} = \frac{13\ 816+30\ 559}{210\ 691}$$

$$\text{Prevalence} = \frac{44\ 375}{210\ 691} \times 100$$

$$\text{Prevalence of hormonal imbalance} = 21.1 \%$$

Altogether, an estimated infertility prevalence of 21.1 % was recorded from this study.

## Discussion

Issues surrounding infertility in women, particularly the cause of infertility prompted the study. Women with hormonal imbalance do not form sufficient follicles to ensure the development of an ovule and as such may render them infertile [15]. In addition to this, the

lack of statistics on hormonal imbalance pertaining to Namibian women and neglect of services along with health care coverage on these issues were the inspirations behind this study.

### **Main findings of thyroid function tests**

The statistical data on the levels of TSH, T<sub>4</sub> and T<sub>3</sub> indicate that majority of the patient's hormonal levels are not within the reference range. Such that an average of 47% of the patients experienced critically high or low thyroid hormone values.

According to Olooto et al [16] the prevalence of hypothyroidism in women of reproductive age is between 2% to 4%. This study agrees with the previous study as the results indicate that an average of 6.0% of women had high T<sub>3</sub> levels of which women. While an average of 7.7% of women had increased TSH levels. This means that 6.0% of the study population had hypothyroidism a condition of low thyroid hormones. When thyroid hormones are low there is a decrease in the negative response in the hypothalamus. Continued release of thyrotropin releasing hormone continues to elevate TSH and prolactin, causing prolactinaemia that eventually leads to ovulatory dysfunction and later infertility [16].

The results also indicate that 11.1 % of the study population had high levels of T<sub>3</sub> and 6.6% had low TSH levels. This means that these percentages of women have a condition known as hyperthyroidism. Hyperthyroidism causes Grave's disease, thyroiditis and goitre. It is also associated with irregular menstrual cycle (oligomenorrhea) [16].

### **Main findings of reproductive hormones**

The data generated indicated that in general the prevalence of an imbalance reproductive hormones used in this study was 36.26% of which approximately 20% was contributed by progesterone.

In the study progesterone results indicate that about 57.8% of women had levels outside the reference range. Majority of these were of women from the 39–49-year age group. This means that more than half of the population may experience the side effects of imbalance progesterone such as endometriosis, polycystic ovarian system that rendered them infertile. Roadblocks in progesterone signalling pathways lead to endometriosis; endometrial growth outside the uterus. High and low levels of progesterone carry the clinical value that is often linked to LH [17].

An average of 9.2% of women had low FSH values while none were recorded with high LH values. These results are in slight agreement with [3] where by high levels of LH and low levels of FHS were recorded in infertile women.

The prevalence of E<sub>2</sub> imbalance 39.7%. This is suggestive that 39.7 % of the women's population experience side effects of the critically high or low E<sub>2</sub> results. Implying that these women experience irregular menstrual cycles and weight gain one can go as far as correlating weight gain with abnormally high E<sub>2</sub> results. As seen in % of the study population. It is further explained that since oestrogen is produced by the primary sex organs and fat cells, obesity will raise oestrogen levels. The body interprets this elevation as birth control and thus reduces the probability of pregnancy. The latter is true that insufficient body fat reduces oestrogen production, leading to menstrual irregularities [16].

The prevalence of PRL imbalance was 11.6%. This means that less than 15% of the study population are likely to have imbalanced prolactin levels of which 10% had hyperprolactinaemia. Hyperprolactinaemia causes infertility by elevating the release of dopamine from the hypothalamus which in turn inhibits GnRH thus leading to infertility [16].

A Nigerian study by Panti and Sununu [18] deduced an 15.1% prevalence of infertility in a demographic of women aged 17-47 years. This is contrary to another Nigerian based study by Adegbola & Akindele[19] in which 26.8% of the study population was rendered infertile. These studies are significantly different suggesting that the infertility rate in that region had decline significantly. This is true for most West African countries that have a high total fertility rate higher than that of Southern Africa [4] .

Statistics provided by [4] support the results from this study that illustrate a high infertility prevalence of 21.1% rendering the total fertility rate low as seen in (Lesthaeghe, 2014) where the value is as low as 3.6.

In this study the main hormone presenting with the most prevalence is progesterone. This is not alarming as progesterone is prone to fluctuations throughout the menstrual cycle from high peaks in preparation for pregnancy to lowest of values to enable the shedding of the uterus lining. As mentioned prior the prevalence percentage is not a concrete indicator of hormonal imbalance and factors such as reproductive status and stage of menstrual cycle were not considered in this study

Overlap of thyroid hormones and reproductive hormones work simultaneously to maintain the functions and development of the reproductive system. Therefore a reduction or unprecedented spike in these hormones will result in hormonal imbalance leading to menstrual anomalies and ultimately infertility.

### **Conclusions**

According to the statistical data generated from this study it is apparent that hormonal imbalance among Namibian women is of great concern. With the strain that the African society places on women to birth large families, infertile women are often ostracized and left with feelings of unworthiness. This supplemented by the mood disorders associated with imbalanced hormones induces depression and suicide. Given the social and medical implications of imbalanced hormones, affected women ought to be educated, supported and treated accordingly. Hosting of educational campaigns on the prevalence and implications on hormone imbalance would aid in destigmatizing infertility. In addition to this provision for hormonal therapy will deal with the primary issue. Employment of social workers trained to support women through the infertility process may reduce risks of suicide among these women. Lastly, more studies should be conducted in the field of female hormones. Further research is required to establish the link between female hormonal imbalance and infertility. In this way, future studies will build and reach areas of discussion that this study was unable to.

### **Limitations of the study**

The Lack of patient clinical data was a limiting factor to this study. The absence of patient information pertaining to the state of menstrual cycle in which each patient was in at the time hormonal tests were conducted or the patient reproductive stage was a liability. This made data analysis challenging as there was no way of knowing exactly whether spiking hormonal values are due to certain peaks experienced during the multiple stages of the menstrual cycle or whether it is due to an actual case of hormonal imbalance. Along with this age is not considered an accurate depiction of patient reproductive stage as it is known that the age of menarche varies with each individual.

As seen in Table 3 there was a lack of accurate data on T4 values of women in Namibia. This may be due to incorrect data collection and as serves as a liability to the study as statistical data on T4 is deemed unreliable.

Lastly the lack information on similar studies conducted in Namibia posed as a challenge in regard to comparison of previous data. Patients with hormone values above or below the reference range are not necessarily considered as hormone imbalanced as the raw data was not analysed according to specifications such reproductive status and menstrual cycle stage as this was not the objective of the study.

Nonetheless it is beyond the scope of this study to address the question of the prevalence of hormonal imbalance according to status or menstrual stage or the prevalence of hormonal imbalance according to geographic location or year.

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### **Declarations**

#### *Ethics approval and consent to participate*

Ethical approval was obtained from the Namibia University of Science and Technology, the Namibia Institute of Pathology and the Ministry of Health and Social Services and the ethics committees. Ethical clearance number *PVM 2020*. The authors declared compliance with all ethical standards.

#### *Consent for publication*

The Authors give Consent for publication.

#### *Competing interests*

All methods were performed in accordance with the relevant guidelines and regulations.

The authors declare no conflict of interest.

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#### *Authors' contributions*

Y.G.A supervised, provided oversight, leadership, editorial comments, and technical input.

Y.G.A, P.VM & K.K designed the study, developed the methodology.

P.V.M. conducted the research.

All authors contributed to the manuscript development.

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