

# Comparison of Modified Ferriman-Gallwey Score and Biochemical Parameters in the Estimation of the Prevalence of Idiopathic Hirsutism among Women in the Kurdistan Region

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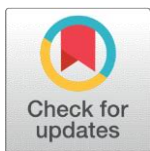
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## ABSTRACT

The word "hirsutism" describes the development of terminal hairs at androgen-controlled body locations in women, which has distress and adverse psychosocial effects. The diagnosis of hirsutism is a crucial point in the treatment of unwanted hair growth in women's bodies. The present study aimed to evaluate the modified Ferriman-Gallwey (mFG) score and the biochemical hyperandrogenism parameters among Iraqi hirsute women and their association with hirsutism in outpatients' clinics in Kalar city, Garmian region, Iraq. A case-control study of 100 hirsute and 26 healthy women was collected in Kalar City. After detailed history taking by using a structured questionnaire, physical examination, and the relevant investigations were done, the scoring of hirsutism was indexed according to (mFG) scoring system.

Moreover, sera of hormonal markers were measured, which included 17-hydroxyprogesterone (17-OHP), total testosterone (TT), free testosterone (FT), dehydroepiandrosterone sulphate (DHEAs), s. prolactin, and thyroid stimulating hormone (TSH). No statistically significant differences were found in the median of the sex and related hormones between control subjects and the hirsutism group. Likewise, there was no significant relation between hormonal markers and the rate of hirsutism. An intrinsic statistical association was seen between the mFG score with the hirsutism and the rate of hirsutism. Our findings imply that the mFG score system is a significant screening tool and has tremendous importance and utility in establishing the diagnosis of hirsutism.

**Keywords** Hirsutism, Sex hormones, PCOS, Prevalence, Etiology, Hyperandrogenism, Modified Ferriman-Gallwey



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## INTRODUCTION

Hirsutism is the appearance of terminal hairs in females in a pattern resembling men's, affecting nearly 10% of women in most populations<sup>1, 2</sup>. Hirsutism is quite distressing for women and adversely affects their psychosocial development.<sup>3</sup> Studies on quality of life have shown that severe hirsutism has a substantial negative impact on social interactions, and afflicted women often experience anxiety and depression symptoms.<sup>4</sup> The effects of ladies' unwanted hair on their psychological and social well-being have long been acknowledged. These may result from the social rejection experienced when defying social norms and the time, effort, and financial commitment required for hair removal.<sup>5</sup>

The majority of hirsutism instances are caused by hormonal disorders, including hyperandrogenism, polycystic ovarian syndrome (PCOS), thyroid disorders, nonclassical congenital adrenal hyperplasia, Cushing syndrome, etc..<sup>6</sup> However, an increase in androgen hormones is the most common cause among hirsute women<sup>7</sup>. Different ethnicities, such as India and the Mediterranean, have higher cutaneous expression of androgen excess and are most likely to develop hirsutism<sup>8</sup>.

Idiopathic hirsutism (IH) is defined as the presence of hair without a known cause. It represents about 10% of all cases of hirsutism and 50% of cases of mild hirsutism<sup>9</sup>. Different reports recorded the Prevalence of IH in different countries (Figure 1), the global pool at 7.74%, Iran 15.8%, Spain 5.4%, Greece 29%<sup>10</sup>, Italy 6%<sup>11</sup>, Turkey 16%<sup>12</sup>, Alabama, USA 17%<sup>13</sup>.

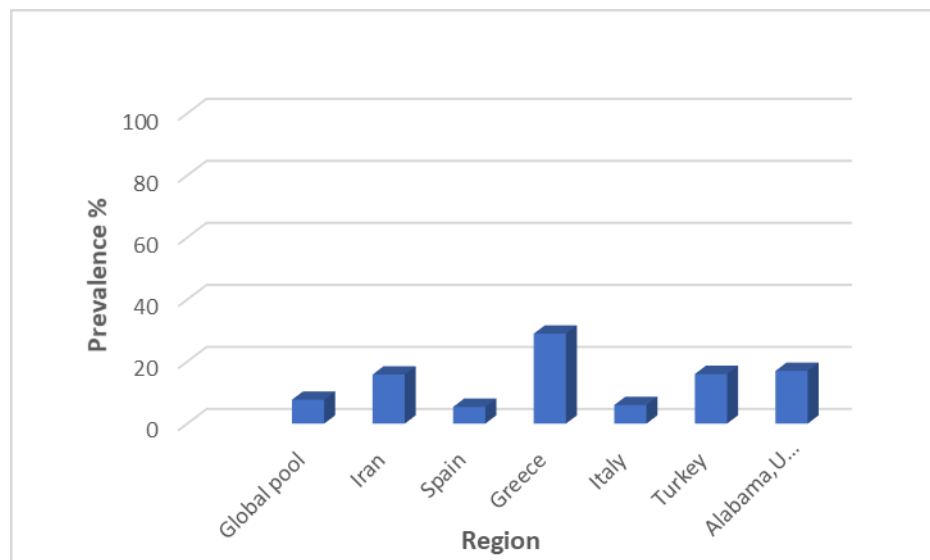


Chart 1: Prevalence ratios of global pool and different countries worldwide

The diagnosis of hirsutism is often based on the clinical symptoms or the measurement of serum androgens, such as free testosterone (FT), total testosterone (TT), dehydroepiandrosterone sulfate (DHEAs), dehydroepiandrosterone (DHEA), and androstenedione<sup>14</sup>. The clinical symptoms are characterized by different conditions such as dark hair growth, amen-

orrhea, deepening voice, acne, etc. Growth of excessive male-pattern hair is the main clinical symptom, and it is determined by using a modified Ferriman-Gallwey (mFG) scoring system<sup>15, 16</sup>.

The gold standard for estimating the density of terminal hairs at nine distinct body locations is presently the (mFG) score<sup>17</sup>. The nine androgen-sensitive body areas include the upper lip, chin, chest, upper and lower back, upper and lower abdomen, upper arm, and thigh[14]. The threshold of total mFG score  $\geq 8$  for the definition of clinically significant hirsutism with values of 8–15 for mild, 16–25 for moderate, and  $>25$  for severe hirsutism<sup>18</sup>.

However, in the poor education communities, Hirsute women feel unfeminine and embarrassed, showing the unwanted hair on their bodies, making the diagnosis difficult for the physicians<sup>19</sup>. Hence, the diagnosis of hirsutism is often based on the obvious clinical symptoms or the measurement of serum androgens<sup>14</sup>.

In the present study, the Prevalence of IH in Kurdish women was evaluated, and the biochemical hyperandrogenism parameters and the modified Ferriman-Gallwey score were also evaluated, to determine the common etiology and the most consistent method in the diagnosis of hirsutism in Kurdish women with excessive hair growth.

## MATERIALS AND METHODS

The following study included 100 hirsute women (age range 17-35 years) who attended gynaecological clinics at Kalar city in the period of April (2019) to November (2020). In addition, 26 women with no symptoms of hyperandrogenism were included as control subjects within the same ages. The different conditions may affect the hormone levels and may contribute to hair growth; therefore, females with the following criteria were excluded in this study: post-menopausal age chronic diseases, goitre, tumours, obesity, alcoholism, medication intake and cigarette smoking. All participants were asked to fill out a consent form to participate in this study, which was approved by the research centre's ethical approval committee (GRCEC0114). The mFG scoring system determined hirsutism. In this method, a professional clinician scored nine different body sites (upper lip, chin, chest, upper back, lower back, upper abdomen, lower abdomen, arm, and thigh) at her clinic. A score of 0 (absence of terminal hairs) to 4 (extensive terminal hair growth) was assigned in each area. A score of over eight was considered as hirsutism.

For the hormonal assay, 5 ml of blood was collected from each participant. Samples were centrifuged for 10 minutes at 4500 rpm, serum separated and split into small fractions, and frozen at  $-20^{\circ}\text{C}$  for further analysis. Sex hormones, including free and total testosterone, dehydroepiandrosterone sulfate, 17-hydroxyprogesterone and prolactin, in addition to thyroid stimulating hormone (TSH), were estimated using Cobas e411 (Roche, Germany).

## STATISTICAL ANALYSIS

The results were analyzed using GraphPad Prism software (Prism for Windows, version 8.0, Boston, MA 02110, USA). To compare the data, the student's t-test was used to compare two independent groups of variables. The analysis was performed with a one-way ANOVA test for more than two groups. The results were expressed as mean  $\pm$  standard deviation. P-value  $< 0.05$  was accepted as statistically significant. Prevalence is expressed as a percentage, calculated by multiplying the ratio of the disease by  $100^{20}$ .

## RESULTS

This study enrolled 100 women experiencing hirsutism, aged between 17 and 35 years. Among the hirsute participants, 7 displayed slightly elevated total testosterone levels, 3 had high free testosterone, 24 exhibited elevated DHEAs, 8 showed increased prolactin, 20 had high TSH, and 8 had low TSH. No significant elevations were observed in total testosterone and 17-OH progesterone levels. Additionally, 76 of the women experienced irregular menstrual cycles, and 12 reported a deepening of voice. Conversely, 14 women displayed normal hormone levels and no apparent clinical signs and were diagnosed as having idiopathic hirsutism (IH). However, comparing hormone data revealed no significant differences between hirsute women and the healthy control group (Table 1).

**Table 1. Blood hormone levels of hirsute and healthy control subjects**

Parameters (Hormones)	Patients Means $\pm$ SD	Control Means $\pm$ SD	P value
17-OHP (ng/ml)	1.431 $\pm$ 0.713	1.310 $\pm$ 0.494	0.656
DHEAs (pg/ml)	368 $\pm$ 175	325 $\pm$ 154	0.295
S. prolactin (ng/ml)	18.70 $\pm$ 9.02	38.8 $\pm$ 97.5	0.370
F. testosterone (ng/ml)	1.99 $\pm$ 1.13	2.74 $\pm$ 2.03	0.085
T. testosterone (ng/dl)	0.338 $\pm$ 0.404	0.453 $\pm$ 0.710	0.412
TSH-1 (mIU/ml)	3.24 $\pm$ 2.57	3.88 $\pm$ 2.50	0.313

Data are expressed as the mean  $\pm$  standard deviation (Means  $\pm$  SD). P value is significant  $P < 0.05$ .

Moderate hirsutism score was detected in 45 women; their scores were between (16-25), and 24 women had severe score results; their score outcomes were above 25. The outcomes based on the hirsutism score are displayed in Table 2. Depending on the hirsutism rating and according to mFG score, our data illustrated that there were strong significant differences between the control group, moderate, and severe hirsutism groups; scores were (5.96 $\pm$ 1.72, 14.08 $\pm$ 2.68, and 23.50 $\pm$ 3.87) sequentially; (P=0.000). However, the results found no significant statistical difference in hormone levels among the three groups (P > 0.05).

(mFG) is modified Ferriman-Gallwey.

**Table 2. The studied markers according to the hirsutism score.**

Parameters	Normal subjects	Hirsutism (Moderate)	Hirsutism (Severe)	P value
mFG score	5.96±1.72	14.08±2.68	23.50±3.87	0.000
17-OH progesterone	1.431±0.713	1.23±0.66	1.71±0.73	0.319
DHEA	368±175	374.7±168.5	355.9±189.1	0.563
S. prolactin	18.70±9.02	20.05±10.11	16.54±6.67	0.397
F. testosterone	1.99±1.13	1.99±1.02	1.98±1.31	0.086
T. testosterone	0.338±0.404	0.362±0.492	0.293±0.150	0.526
TSH	3.24±2.57	3.15±2.46	3.41±2.86	0.573

## DISCUSSION

Hirsutism is the excessive development of thick, black hair in areas of the body where female hair growth is often nonexistent or low. These male-pattern terminal hairs often develop in androgen-stimulated areas, including the chin, chest, and face<sup>21, 22</sup>. The psychological and social impact of hirsutism on women underscores the importance of accurate diagnosis and effective treatment. Previous suggestions have pointed to idiopathic hirsutism (IH) as the most prevalent cause of hirsutism, particularly within the Middle Eastern community where racial or idiopathic hirsutism was considered the primary aetiology<sup>23, 24</sup>; the Prevalence of IH was assessed to be 5-15% in women of reproductive age in most populations<sup>25, 26, 27</sup>.

Data of the 100 consecutive patients showed that 14% of the hirsute women were diagnosed as IH; this ratio is within the reported whole populations ratio and near the other countries reported data, Iran 15.8%, Turkey 16%<sup>12</sup>, and Alabama, USA 17%.

It is uncertain which blood test most precisely represents the clinical situation and best corresponds with the degree of hirsutism, even though several hormones have been related to the condition<sup>28</sup>. The androgen most often investigated in individuals with hirsutism is testosterone<sup>29</sup>. However, the present study showed that DHEAs is the most important androgen that may be useful in diagnosing hirsutism. Increased amounts of androgen hormones or higher sensitivity of hair follicles to these hormones may cause it, and it is often the consequence of an underlying endocrine imbalance that may be central, ovarian, or adrenal in origin<sup>28</sup>.

Although data showed a non-significant difference in TSH between hirsute and normal women, abnormal TSH levels contributed to 28% of all the included cases. The connection between thyroid dysfunction and the aetiology of hirsutism may be associated with the link between thyroid diseases and polycystic ovarian syndrome (PCOS)<sup>30, 31</sup>; sufficient data supports the assertion that the Prevalence of thyroid dysfunction is elevated in women with polycystic ovarian syndrome (PCOS)<sup>32</sup>, our data also supports this argue. Polycystic ovarian syndrome (PCOS), the most prevalent endocrine disorder, involves multiple dysfunctions associated with abnormal hair growth. The pathogenesis of PCOS is complex and influenced by the biosynthesis of steroid hormones. In response to luteinizing hor-

mone (LH) stimulation from the pituitary gland, ovarian theca cells generate androgens. Cytochrome P-450c17, an enzyme with 17 $\alpha$ -hydroxylase and 17,20-lyase activity, triggers androstenedione production. Subsequently, this compound is converted into testosterone by 17 $\beta$ -hydroxysteroid dehydrogenase or into estrone by aromatase. In individuals with PCOS, there is a predisposition for the metabolic pathway favouring testosterone production at this step.<sup>33</sup>

One of the study's limitations is the small sample size, which may affect the precision of the results. In addition, the diagnosis of PCOS using an ultrasound tool may be useful to determine the most important physiological factor that may contribute to hirsutism. More studies are needed to examine the effect of the changes in dietary habits, the pollution in our weather, and their relation to this issue.

## CONCLUSION

In conclusion, this study sheds light on the unique characteristics of hirsutism in the Kurdistan region. Idiopathic hirsutism is a relatively uncommon aetiology of hirsutism in Kurdish women; however, the issue presents a distinctive challenge in diagnosis. The utilization of mGF as a diagnostic tool emerges as a promising alternative to traditional blood hormone estimation, offering potentially greater reliability in identifying and addressing hirsutism.

Elevated androgen levels, notably associated with conditions such as polycystic ovary syndrome (PCOS), remain a significant contributing factor. Additionally, the robust implication of thyroid dysfunction in hirsutism emphasizes the complexity of the underlying aetiology.

## LIST OF ABBREVIATIONS

- ANOVA: Analysis of variance
- DHEAs: dehydroepiandrosterone sulfate
- DHEA: dehydroepiandrosterone
- FT: free testosterone
- IH: Idiopathic hirsutism
- mFG: modified Ferriman-Gallwey
- 17-OHP: 17-hydroxyprogesterone
- PCOS: Polycystic ovary syndrome
- TT: Total testosterone
- TSH: thyroid stimulating hormone

## DECLARATIONS:

### Authors' contributions:

Contributor Role	Degree of Contribution		
	Lead	Equal	Supporting
Conceptualization		BMJ, HAM , AP	
Data curation		BMJ, HAM, AP	
		BMJ, HAM, AP	
Funding acquisition		BMJ, HAM, AP	
Investigation		BMJ ,HAM, AP	
Methodology		BMJ, HAM, AP	
Project administration		BMJ, HAM, AP	
Resources		BMJ ,HAM, AP	
Software		BMJ, HAM, AP	
Supervision		BMJ, HAM, AP	
Validation		BMJ, HAM, AP	
Visualization		BMJ, HAM, AP	
Writing-original draft		BMJ, HAM, AP	
Writing-review & editing		BMJ, HAM, AP	

**Conflict of interest:** None

**Ethical Approvals:** The research was conducted in accordance with ethical standards and guidelines, and any necessary approvals from institutional review boards or ethical committees were obtained.

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