



Women Hormonal Imbalance: Risk Factors, Clinical Characteristics, and Nutritional Status

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ABSTRACT

Introduction

In the health of women, hormones play an essential and significant role in the body functions. Fluctuation in any hormone levels in a woman may lead to hormonal imbalance. The aim of the present work was to study risk factors, clinical characteristics and nutritional status of female hormonal imbalances.

Methods

A cross-sectional study used to select a random sampling of women attended gynecological, endocrinology and fertility clinical. A total number of samples collected was 150 through pre-designed questionnaires include women with age groups between 19-68 years. Data was collected in the month of October 2018 to May 2019 and analyzed by using Chi-square test for significant differences at $\alpha < 0.05$.

Result and discussion

The data collected on 150 patients shown that, both polycystic ovaries and passive smoking 33.3% and 27.3% respectively among the risk factors. In addition, increased oral contraceptive uses also shown significantly impact on hormonal changes ($P=0.000$). No relationship has been found between age of married, space between births and number of children and hormonal imbalance. Hormonal imbalance significantly increased in married women ($P=0.000$) and physically inactive women ($P=0.000$). Married women particularly at age >45 years have most complain of hormonal disturbed. The clinical characteristic shown that sleep disorder, amenorrhea and abdominal pain were common signs reported. Furthermore, HTN, kidney disease and DM and history of surgical operation have significant relation with hormonal imbalance. In addition, increased body weight, waist circumferences, waist hip ratio, serum TG, VLDL, HBA1C and decrease levels of vitamin D were associated with women hormonal imbalances.

Conclusion.

The present study demonstrated that significant increased hormonal imbalance due to numbers of factors with some clinical features reported and abnormal nutritional and biochemical results ranging from imbalance diet, low physical activities, high body weight, waist circumferences and waist hip ratio. In addition, abnormal serum TG, VLDL HBA1C, progesterone, estrogen, TSH, T4, Prolactin, T3 and vitamin D were detected. The data in this study suggested that regular check hormonal levels are essentially among married women.

Keywords: Women hormonal imbalance; nutritional status; risk factors; clinical feature; infertility.

1. Introduction:

Hormones are essentially for regulation body function and structure (1). Hormone imbalance or hormonal disturbance is asymptomatic or inconsequential and can cause diseases from mild to severe which include thyroid disorders, diabetes, dermatological disorder, weight gain, or infertility (2). Imbalance in hormonal secretion may implicate in problems that evolved in life terrible (3). Hormone imbalance or disturbed may be considered as a silent killer and is emerging as a true epidemic worldwide (4). Fluctuation in hormone levels, particularly progesterone and estrogen in women may have undesirable impact on the mood, ovulation, sexual desire, and fertility (5). Hormonal disturbance can also cause menopausal disorders in females (6). Elevated free estrogen levels in the women have linked to early menarche, eating disorders, endometriosis, menstrual disturbances, muscular cramps, heavy bleeding, infertility and breast cancer (6).

In recent years and due to modernization, led to an intensive advancement and changes in life styles which has made human more vulnerable to health changes particularly in irritability, restlessness, mood swings, and abruptness in behavior(7).All these symptoms have contributed to hormone imbalance. These effects increase as one ages and become more pronounced and difficult to treat. Moreover, studies have been conducted on rats and humans to indicate that environmental contamination due to pollution has devastating effects on the overall health of an individual at all most all the ages by causing women hormone disruptions and various disorders. There are many factors can cause of women hormonal imbalance include oral contraceptive medications, hormone replacement therapy, stress, poor diet, environmental pollutions, eating disorders, lack of physical activity, weight gain, ages, polycystic ovary syndrome (PCOS), and abnormal cervical mucus (7).Any fluctuation or changes in estrogen levels due to physical stress, low fat or low carbohydrate diets, or drastic weight loss may contribute to anxiety, restlessness and sleep disturbance (8).

Adequate and balanced diet is crucial for women hormonal health (9). Improper nutrition and food intake seems play significant role in the physical change of brain proteins and consequently can no longer send the proper signals for normal ovulation (10). Due to increased prevalence of hormonal imbalance worldwide and lack of information regarding its association with risk factors, clinical characteristics and nutritional status and therefore, aimed to investigate and identify the general risk factors, clinical feature and nutritional status associated with or implicated in develop hormonal imbalance.

2. Materials and methods:

2.1 Study population

A cross sectional study carried out from October 2018 to May 2019 and a data was collected from endocrinology, gynecology and fertility clinical on patients with hormonal imbalance seeking treatment in Benghazi, second largest city in Libya.

Approached of our study is aged groups attending the Benghazi medical center. Random sampling method was used to collect data from the females of age 19-68 years from public hospital. A specially designed questionnaire was used for data collection.

The samples 150 subjects were involved in the study. After obtaining written consent, the subjects were requested to fill out a questionnaire and proceed to a private area to have their height and weight measured. Although we approached different number of subjects and the final completed questionnaires in hand were 150. Hence, our overall response rate was 99%.

2.2 Questionnaire.

The questionnaire for this study based on 36 items divided into four sections. It contained questions about personal information, demographic and socioeconomic characteristics, physical activity and personal habit, family history of hormonal defect, risk factors, biochemical investigations, clinical features, food intake and history of disease and types of foods intake.

2.3 Measurements.

Accessible anthropometric used as availability and noninvasive measurement include body weight, height, waist and hip. Weight and height were measured after completion of the questionnaires and hand in by two researchers. Height was measured to the nearest 0.1 cm using standard calibrated scale attached to the balance against a wall. Weight was measured to the nearest 0.2 kg using weighing machine. All measurements were collected with participants in either thin socks or barefoot and with heavy clothing items taken away. Body mass index (BMI) was calculated as previous described (13) waist circumferences was measured at the narrowest level over light clothing, using an unstretched tape meter, without any pressure to body surface and measurements were recorded to the nearest 0.1 cm. WHR was calculated as describe in (13). With the waist-to-hip ratio the WHO defines the ratios of >0.85 in women as one of the decisive benchmarks for metabolic syndrome. A waist circumference >35 inches (88 cm) in women is to be high risk (14).

2.4 Biochemical tests.

The laboratory tests were obtained include testing for hormones include prolactin, progesterone, Estrogen, androgen, TSH, T3 and T4 and also other tests include lipid profile, CBC, serum vitamin D, calcium and blood glucose. Data were collected by semi-structured interviews and from medical records of patients and all patients were non-pregnant.

2.5 Ethical statement.

This study was approval by the local Ethics Committee of the Benghazi province. Informed written consent was obtained through a consent form that was given to the participants along with the questionnaire.

2.6 Statistical analysis.

The data from the questionnaires was entered using Excel. Data set was exported to SPSS v.18 and Epi-info for complete analysis. Statistical analysis was carried out for the complete sample which were created according to measured BMI: underweight, normal and overweight. Mean values and standard deviation for all continuous variables: weight, height, BMI, age, genders and other variables for all groups were obtained. Frequencies for each categorical variable were calculated for each group as well. To determine the differences regarding each categorical variable in the groups, Chi-square test was performed.

3. Result:

3.1 risk factors:

According to the finding in table (1) the age groups between 46-60 years old significant predominant (38%) in the study ($P=0.00$) and this age with further investigation through marital status distribution was confined to those married, while the other ages groups close related to each (table 1).

Table 1: Age categories in patients with hormonal imbalance:

Age Categories (years)	N	N %	*P values
19-25	8	5.3%	0.00
26-30	14	9.3%	
31-35	10	6.7%	
36-40	20	13.3%	
41-45	22	14.7%	
46-60	57	38.0%	
>60	19	12.7%	
Total	150	100.0%	

*Chi-square test was done and considered significant at $\alpha < 0.05$.

In the table (2), the common risk factors contribute in an increased hormonal imbalance were polycystic ovaries and passive smoking 33.3% and 27.3% respectively. In addition, increased oral contraceptive uses also shown significantly impact on hormonal changes ($P=0.000$).

Table 2: Risk factors for hormonal imbalance:

Risk factors	N	Percentages %	*P values	
Variables	Polycystic ovaries	50	33.3%	0.000
	Passive smoking	41	27.3%	
	TSH	23	15.3%	
	Prolactin	25	16.1%	
	T3 + T4	12	8%	
	Total	150	100.0%	
birth control pills	Yes	128	85.3%	
	No	22	14.7%	
	Total	150	100.0%	
intrauterine device	Yes	25	16.7%	
	No	125	83.3%	
	Total	150	100.0%	

*Chi-square test was done and considered significant at $\alpha < 0.05$.

The result of data collecting on 150 patients shown that no relation between age of married, space between births and number of children and hormonal imbalance. (Table 3).

Table 3:Other risk factors contributed to hormonal imbalance:

Variables		N	N %
age of married	single	35	23.3%
	< 18	41	27.4 %
	18-25	32	21.3%
	26-40	42	28.0%
	Total	150	100.0%
number of children	No	40	26.7%
	1	11	7.3%
	2-4	12	8%
	5-7	33	22.0%
	7-10	38	25.3%
	>10	16	10.7%
	Total	150	100.0%
space between births	No child or first child	57	38.0%
	< 1 year	22	14.7%
	1-2 years	36	24.0%
	2-3 years	22	14.7%
	3-4 year	8	5.3%
	>5	5	3.3%
	Total	150	100.0%

Socioeconomics and physical activities of patients have been summarized in table (4) by which hormonal imbalance significantly increased in married ($P=0.000$) and physically inactive women ($P=0.000$).

Table 4: Socioeconomic and physical activities as a risk factors for hormonal imbalance:

characteristics		N	N %	*P values
marital state	Single	35	23.3%	0.000
	Married	102	68.0%	
	Divorced	6	4.0%	
	Widow	7	4.7%	
	Total	150	100.0%	
level of education	Illiterate	17	11.3%	0.000
	Primary	43	28.7%	
	Secondary	38	25.3%	
	University	45	30.0%	
	Others	7	4.7%	
	Total	150	100.0%	
physical activity	Yes	32	21.3%	0.000
	No	118	78.7%	
	Total	150	100.0%	

*Chi-square test was done and considered significant at $\alpha < 0.05$.

3. 2 Clinical characteristics

In the table (5) shown that, the sleep disorder (28%) and amenorrhea (26%) were occupied the highest symptoms complained by the patients.

Table 5: Most common symptoms of hormonal disturbance:

Symptoms	N	N %
Sleep disorder	42	28%
Acne	17	11.3%
Abdominal pain	30	20%
Amenorrhea	40	26%
Dysmenorrhea	24	16%
fatigue	20	13%
Total	150	100.0%

Next, through the further investigation of ages and marital status distribution the result shown that, married women at age groups between 46-60 most prone to hormonal imbalances ($P=0.01$) (Table 6).

Table 6: relationship between age and marital status of patients:

Age categories (years)	marital state									
	Single		Married		Divorced		Widow		Total	
	N	N %	N	N %	N	N %	N	N %	N	N %
19-25	8	5.3%	0	.0%	0	.0%	0	.0%	8	5.3%
26-30	8	5.3%	4	2.7%	2	1.3%	0	.0%	14	9.3%
31-35	2	1.3%	8	5.3%	0	.0%	0	.0%	10	6.7%
36-40	5	3.3%	14	9.3%	0	.0%	1	.7%	20	13.3%
41-45	6	4.0%	16	10.7%	0	.0%	0	.0%	22	14.7%
46-60	5	3.3%	*45	30.0%	4	2.7%	3	2.0%	57	38.0%
>60	1	.7%	15	10.0%	0	.0%	3	2.0%	19	12.7%
Total	35	23.3%	102	68.0%	6	4.0%	7	4.7%	150	100.0%

*significant at $\alpha < 0.05$ by Chi square test.

Through the biochemical investigation of different hormones that responsible for imbalance in the female, the present study found that elevated levels of all hormones listed in table (7), with exception of T3 which shown low levels compared to standard values.

Table7: hormonal levels in patients with hormonal disturbance:

Serum hormonal levels	Mean \pm SEM	*Reference values
progesterone	31 \pm 3	0.2-16ng/ml
estrogen	61 \pm 26	0-40pg/ml
androgen	3 \pm 0	< 1
TSH	7 \pm 3	0.4-4.2
T3	77 \pm 6	80-180
T4	103 \pm 9	4.6-12 μ g/dl
Prolactin	82 \pm 16	< 25ng/ml

*Result from local laboratory reference values

In table (8), self-reported complication among patients were HTN (18%), kidney diseases (17.3%) and diabetes (16.7%) were represent the highest numbers. In addition, there was a relation between history of surgical operation and hormonal disorder ($P=0.02$).

Table 8: Most common self-reported complication among patients.

Complications		N	N %	*P values
complain	No	41	27.3%	0.02
	Anemia	10	6.7%	
	DM	25	16.7%	
	HTN	27	18.0%	
	CVDs	7	4.7%	
	Kidney diseases	26	17.3%	
	Arthritis	4	2.6%	
	Respiratory disease	10	6.7%	
	Total	150	100.0%	
history of surgical operation	Yes	89	59.3%	
	No	61	40.7%	
	Total	150	100.0%	

*Significant at $\alpha < 0.05$ by Chi square test.

3.3 Nutritional status

In biochemical investigations, low vitamin D levels, high of FBG, HBA1C, VLDL and serum TG have been found reported by patients (Table 9).

Table 9: Biochemical laboratory tests:

Tests	Mean \pm SEM	*Reference values
ca	9.6 \pm 1	9-10.5 mg/dl
Vitamin D	<u>17.2\pm 2.3</u>	25-50 ng/dl
CBC	12 \pm 0	12-15 mg/dl
Fasting blood glucose	113 \pm 10	70-115
HBA1C	<u>7\pm0</u>	<6.5%
LDL	108 \pm 23	100-130 mg/dl
HDL	53 \pm 4	>45 mg/dl
VLDL	<u>55\pm13</u>	<30 mg/dl
S.TG	<u>275\pm27</u>	<150 mg/dl
S.CH	146 \pm 23	<200 mg/dl

*Result from local laboratory reference values.

The patients in the study shown to have high BMI, waist and waist hip ratio with mean± SEM of 33±1, 107±1 and 1±0 respectively (Table 10).

Table (10): anthropometric measurements for the patients:

Indices	Mean± SEM
BMI	33 ± 1
Waist	107± 1
WHR	1± 0

BMI categories obese, high WHR and high waist circumference were significantly increased in patients ($P < 0.05$) (Table 11).

Table 11: categories of some anthropometric measurements.

		N	N %	*P values
BMIcategories	underweight	6	4.0%	0.002
	normal weight	19	12.7%	
	overweight	31	20.7%	
	obese	94	62.7%	
	Total	150	100.0%	
WHR	low	46	30.7%	0.01
	moderate	5	3.3%	
	high	99	66.0%	
	Total	150	100.0%	
Waist circumferences	low risk	16	10.7%	0.000
	high risk	134	89.3%	
	Total	150	100.0%	

*Chi-square test was done and considered significant at $\alpha < 0.05$.

Increased consumption of certain foods such as chicken, fruits, vegetables, eggs, milk, starchy foods, coffee, tea and sweets have foods significantly increased among the patients ($P < 0.05$). (Table 12A-B).

Table 12 A: Types of foods consumption:

Foods items		Count	Column N %	P values
Milk	Yes	*121	80.7%	0.000
	No	29	19.3%	
	Total	150	100.0%	
Vegetables	Yes	*124	82.7%	0.000
	No	26	17.3%	
	Total	150	100.0%	
EGG	Yes	*130	86.7%	0.000
	No	20	13.3%	
	Total	150	100.0%	
fruit	Yes	*124	82.7%	0.000
	No	26	17.3%	
	Total	150	100.0%	
chicken	Yes	*129	86.0%	0.000
	No	21	14.0%	
	Total	150	100.0%	
red meat	Yes	72	48.0%	
	No	78	52.0%	
	Total	150	100.0%	
legumes	Yes	70	46.7%	
	No	80	53.3%	
	Total	150	100.0%	
fish	Yes	37	24.7%	
	No	113	75.3%	
	Total	150	100.0%	
starchy food	Yes	*130	86.7%	0.000
	No	20	13.3%	
	Total	150	100.0%	

Table 12 B: Types of foods consumption:

		N	Percentages %	P values
cereal	Yes	34	22.7%	
	No	116	77.3%	
	Total	150	100.0%	
drink coffee	Yes	*109	72.7%	0.00
	No	41	27.3%	
	Total	150	100.0%	
tea	Yes	*115	76.7%	0.00
	No	35	23.3%	
	Total	150	100.0%	
soft drinks	Yes	70	46.7%	
	No	80	53.3%	
	Total	150	100.0%	
carbonated drinks	Yes	37	24.7%	
	No	113	75.3%	
	Total	150	100.0%	
fast food	Yes	28	18.7%	
	No	122	81.3%	
	Total	150	100.0%	
nuts	Yes	58	38.7%	
	No	92	61.3%	
	Total	150	100.0%	
sweet	Yes	*107	71.3%	0.00
	No	43	28.7%	
	Total	150	100.0%	
crackers	Yes	81	54.0%	
	No	69	46.0%	
	Total	150	100.0%	
fatty food	Yes	49	32.7%	
	No	101	67.3%	
	Total	150	100.0%	

4. Discussion:

In the present study, there were a numbers of risk factors have been investigated, by which the most common impact on hormonal disturbed was polycystic ovaries and passive smoking ($P < 0.05$). There were also other hormonal been studies included TSH, Prolactin and T3+T4 but have no profound effect. Furthermore, among the strong risk factors found to have significant increased hormonal imbalance was birth control pills ($P = 0.000$). Some of these factors include polycystic ovaries, TSH and prolactin have been extensively studied somewhere else (15-17) as a major risk factors for hormonal imbalance. Nevertheless, the others not yet, such risk include passive smoking and birth control pills. However, the active smoking was linked to increases the plasma levels of some hormones which include prolactin, growth hormone, adrenocorticotrophin (ACTH), without affecting significantly on the changes of TSH, follicle-stimulating hormone (FSH) and luteinizing hormone (LH) and (18, 19).

Hormonal imbalance is associated with some symptoms (20) therefore, the present study identified some most common symptoms which represented include sleep disorder and amenorrhea and this result similar to the finding of previous studies (21, 22). Interestingly, hormonal disturbance has been significantly associated with married status and physically inactive women. Ennour et al (23) and De Cree (24) reported that the physical activity enhanced a decrement in circulating sex hormones this finding was inconsistent with the current study. While the marital status of married women have not received enough attentions. The patients with hormonal imbalance, has been reported comorbid condition include hypertension, kidney diseases, DM, anemia, respiratory disease, CVDs, and arthritis. These complications could be due to or hormonal replacement therapy. History of surgical operation among women was predominant, so hormonal imbalance could be caused by such factor. Surgical operation could be additional risk factor for developing hormonal changes and this need further investigation. Furthermore, the ages of women significantly related to hormonal imbalance were those between 46-60 years. This age is considered as postmenopausal ages. Though the menopause is associated with hormonal changes include hypothalamic and pituitary hormones that regulate the menstrual cycle (25). As described in the previous works (25, 26) the hormonal imbalance mostly influences the menopausal ages and this also disagree with the present finding of this study.

As a part biochemical investigation of different hormones that responsible for imbalance in the female, the present study found that abnormal elevated levels of all hormones listed in table (7), with exception of T3 which shown low levels. The values in the current study were agree with the previous work in case of estrogen and progesterone (27, 28) but not for other hormones.

The investigation of nutritional status of the participants revealed that abnormal low levels of vitamin D, and high levels of serum TG, VLDL, HbA1C and FBG in patients. In regarding vitamin D status, knight and et al (27) found that higher levels of vitamin D may reduce progesterone and estradiol, but this was not similar to the finding of present work, in which low levels vitamin D associated with lower female reproductive hormones. In compared to the work of Mesalic and et al (28), hormonal imbalance particular estrogen has been found negatively associated with lipid profile include TG and VLDL and this finding was disagree with the current study.

Consumption of certain foods have been associated with hormonal disturbance and these foods listed in table (12 A-B) some of these were nutritious foods, junk foods, tea, coffee and sweets. Food imbalances were clearly identified in patients whom consumption more frequent chicken, eggs, starchy foods and other junk foods. Our study was not consistent with other finding by which increased foods consumption 3-4 times more than the finding of SafilaNaveed et al (1, 29) and such foods could play part in hormonal imbalance. The patients in the study shown have high BMI, waist and waist hip ratio with mean \pm SEM of 33 ± 1 , 107 ± 1 and 1 ± 0 respectively. Although body mass index categories shown significantly increased body weight by which most common obese ($P < 0.05$) and similarly for waist and WHR and both were high risk categories and this could be due to imbalance food intake in our subjects. The all heavier BMI, high Waist circumference and WHR could consider additional risk factors for hormonal imbalance. Similarly has been reviewed by RoopJkin which estrogen dominance was associated with weight gain (3, 30).

Overall summary, the present study highlighted some new factors that either directed or undirected affect hormonal balance, which include body weight, waist circumferences, WHR, low vitamin D values and high hormonal levels. Its highly recommended that, regular checkup of all married women and strongly advocated that in order to keep down the female hormone under normal levels and hence reduce the complications.

5. Conclusion:

The present study revealed that, significant increased hormonal imbalance with some factors include used oral contraceptive pills, polycystic ovaries and passive smoking women. Furthermore, the symptoms have been reported in patients with hormonal imbalance were sleep disorder and amenorrhea. In addition, hormonal imbalance significantly increased in married and physically inactive women. There were a complications were shown in the patients include HTN, Kidney diseases and DM. Additional risk factors could be accounted for hormonal disorder was history of surgical operation ages of patients between 46-60 years old. Imbalance foods consumption, heavier BMI, high Waist circumference and WHR could consider an additional risk factors for hormonal imbalance. Different hormonal levels were demonstrated with abnormal higher levels such as prolactin, estrogen, progesterone, T4, TSH and androgen but not T3 by which shown lower than the reference values. There were also abnormal levels of vitamin D; FBG, HBA1C, VLDL and serum TG have been identified in patients. The data of this study suggested that hormonal levels should be investigated regularly in all reproductive and child bearing women.

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