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WAIST-HIP RATIO (WHR), ASSOCIATION WITH SERUM HIGH SENSITIVE C-REACTIVE PROTEIN (hsCRP) AND TSH: A RECENT UPDATE

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Abstract

Waist-Hip Ratio (WHR) serves as a crucial marker for assessing abdominal obesity (AO). AO is characterized by excess fat accumulation around the waist, usually seen to be linked to a higher chance of developing metabolic and cardiovascular disorders. The prevalence of AO, in North Indian females, has been linked with a higher level of Thyroid-Stimulating Hormone (TSH), showcasing an intricate relationship between endocrine function and fat distribution. Hs-CRP is observed in individuals with obesity, emphasizing its association with metabolic health, inflammation, and adipose tissue. Therefor understanding of these associations is vital for addressing public health concerns and developing targeted interventions to mitigate the adverse outcomes linked to abdominal obesity.

INTRODUCTION

Obesity can be categorized into Generalized Obesity (GO) & Abdominal Obesity (AO), both of which are associated with higher morbidity & mortality rates. While AO is characterized by fat buildup around the waist & is assessed using the WC & WHR, GO is assessed using the Body Mass Index (BMI) [1]. The WHR is a ratio between WC and HC, and it is measured by stretch resistant tap at specific point on the waist, this is situated near the iliac crest's halfway point and the lower edge of the last palpable rib, the Hip Circumference (HC) is measured with relation to the floor at a level at the widest circumference of the buttocks. According to current guidelines by WHO for South Asians, AO is defined as having WC ≥85 cm in the case of women, ≥90 cm in the case of men.

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The value of WHR for men ≥0.90 and for women ≥0.85 shows the AO [2]. Bhardwaj S, et al. (2023), reported a prevalence of AO as almost 31% in the Western Uttar Pradesh region in the age range between 18- 24 years. In North Indian females have 75% abdominal prevalence [3].

The study published in 2018 states that the abdominal obesity shows pear shaped body have fat deposition on viscera and omental [4]. With the rise in WHR the occurrence of cardiovascular diseases (CVD) increases. For every centimetre increase in WC, the relative risk of a CVD incident increases by 2%. By the rise of 0.01 in WHR, the relative risk increases by 5%, suggesting WHR is a better index for assessment of AO as compared to WC [5].

Inflammation and Abdominal Obesity

Acute-phase protein known as hs-CRP is produced by the liver in reaction to infection and chronic inflammatory diseases. Increasing data indicates that atheromatous plaque macrophages contain hsCRP as well [6].

To address these significant public health concerns, acquiring a better understanding of the way obesity, weight gain, and the onset of low-grade chronic inflammation are related may be beneficial. A few risk factors have been linked to high levels of hsCRP, including age, smoking, blood pressure, triglycerides, body mass index, WC and BMI. It is therefore regarded as the primary modulator of hepatic inflammatory response and hsCRP stimulant [7, 8].

Research conducted by Santa-P R et al., (2022) and other has demonstrated that individuals with abdominal obesity possess greater concentrations of inflammatory markers, such as hs-CRP, in comparison to those of normal weight, probably rise in increase in fat tissue predisposes to the chronic low-grade inflammation [9]. It has been observed elevation of serum hsCRP levels in abdominal obese children as well as in adolescents in compared to normal non-obese subjects. Therefore, the raise hsCRP in obese young generation unwind to obesity may precipitate by cardiovascular (CVD) disease in later age [10].

Thyroid Stimulating Hormone (TSH) & Abdominal Obesity

There were higher levels of serum TSH in the subjects and positively correlated with Abdominal Obesity (AO) [11]. The individuals prone to metabolic disorders are also have elevated TSH the adolescent and young adult who have rise WHR shows elevated level of TSH and hsCRP [12, 13]. It has been proposed that the rise in TSH may be a protective device obese person's by increasing energy expenditure in order to counterbalance the buildup of fat [14]. This is an attempt to overcome the decreased adipocyte tissue responsiveness to thyroid hormones [15, 16].

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Relation of hsCRP and TSH

Serum TSH and hs-CRP levels have been shown to have significant positive correlation. Several symptoms rise in hypothyroidism that suggested an inflammatory state by the interaction between TNF-α and IL-1, as well as IL-6, cause the elevated hsCRP levels. The rate of hsCRP clearance may be hampered by thyroid hormone deficiency, which might be one cause of the rise in blood hsCRP levels. Similarly, this behaviour may potentially be exacerbated by sluggish hsCRP absorption in target cells [17].

Summary of the Studies

Study	Conclusion
Singh S et al., 2023	The Serum TSH & TNF-α levels showed positive correlation with WC in young females of age 18-24 years with abdominal obesity. This anthropometric parameter (WC) may be useful in appropriate interventional measures like healthy lifestyle & diet may lower the risk of thyroid disorder by controlling abdominal obesity.
Demir Ş et al., 2021	TSH has a positive correlation with adiposity measures including BMI, PBF, and BAI, whereas fT3 levels have a correlation with indices that rise with abdominal obesity, such WC and WHR.
Bhat R et al., 2020	It had been found that serum TSH levels were extremely significantly correlated with BMI, WC, and WHR. When comparing obese people to normal participants, the mean TSH levels were greater in the obese.
Kshetrimayum V et al., 2019	Low-grade inflammation and modest dyslipidaemia are linked to hypothyroidism (CH & SCH), which is more frequent in women. It is also more prevalent for subclinical hypothyroidism than for clinical hypothyroidism.
Lavanya K et al., 2017	Although there is a substantial correlation between hs-CRP and overweight and obesity, suggesting that obesity is a chronic inflammatory illness, hs-CRP levels can be used as a predictor of morbidity in the future. Since obesity has increased in India in recent years and is detrimental to the country's healthcare and socioeconomic sectors, hs-CRP can be used to predict the risk of obesity-related disorders so that early intervention can be provided.
C. Bétry et al., 2015	In obese subjects, TSH levels elevated as BMI increased. Regardless of BMI, this was associated with leptin. Patients with obesity showed elevated blood TSH levels, which may be related to both the accumulation of fat mass and a balanced calorie intake.
Mamtani M et al., 2014	There is an independent correlation between WC and a higher risk of thyroid dysfunction. Future research should evaluate that WC is used to find individuals who are Mexican Americans and have a greater risk of thyroid problems.
Ponnala A et al., 2013	When compared to a group of people with normal weight, obese children and adolescents had a considerably higher high-sensitivity CRP. Early intervention and the prevention of childhood and teenage obesity minimize the risk of cardiovascular disease in later life.

CONCLUSION

The article concludes that abdominal obesity, as indicated by WHR and WC, correlates with elevated TSH levels and increased inflammatory markers, such as hs-CRP. This association underscores the intricate interplay between metabolic factors, abdominal fat distribution, thyroid function, and low-grade inflammation, emphasizing the potential impact on overall health and inflammation-related risks.

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