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Original Article

Prevalence of Goiter Disease to the Human Population of District Buner, Khyber Pakhtunkhwa, Pakistan

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ABSTRACT

Background: Goiter, an enlargement of the thyroid gland, continues to be a significant global health issue, affecting approximately ten million people worldwide. The prevalence of goiter is notably influenced by geographical and environmental factors, such as soil iodine content, especially in hilly terrains. Prior research has indicated a gender and age-related predisposition to the condition, with varied prevalence across different regions.

Objective: This study aimed to ascertain the prevalence and demographic distribution of goiter in District Buner, Khyber Pakhtunkhwa, Pakistan, and to compare these findings with data from other regions to better understand the condition's epidemiological characteristics.

Methods: A cross-sectional study was conducted from September 2021 to September 2022. A total of 280 patients from six tehsils within District Buner were investigated through questionnaires and medical examinations by healthcare professionals. Data collection occurred weekly across multiple healthcare facilities, including medical centers, rural health centers, and the District Headquarters Hospital in Buner.

Results: Out of 280 patients, 78% were females, indicating a higher prevalence among women. The highest prevalence among males (33%) was recorded at 70 years of age, while for females, it peaked (86%) at 50 years. The majority of cases belonged to the age group of 30-60 years. Multinodular goiter was the most common type observed. The data also reflected a higher incidence of goiter in hilly regions compared to plain areas, likely due to iodine deficiency.

Conclusion: The study confirmed that goiter is more prevalent among females and tends to increase with age. The high incidence in hilly areas supports the association with low soil iodine content. This research underscores the need for targeted public health strategies, including iodine supplementation and education, particularly in at-risk areas.

Keywords: Goiter, Thyroid Enlargement, Prevalence, Iodine Deficiency, District Buner, Epidemiology, Public Health.

INTRODUCTION

The thyroid gland, a vital endocrine organ situated in the anterior neck across the C5-T1 vertebrae, plays a pivotal role in regulating the body's metabolic rate(1). Resembling a butterfly in shape with two lobes connected by an isthmus, this gland is responsible for synthesizing iodine-containing hormones—triiodothyronine (T3) and thyroxine (T4)—as well as the peptide hormone calcitonin(2). These hormones are integral to a range of physiological processes, including metabolism, growth, and development(3). Calcitonin, in particular, is produced in response to high blood calcium levels and functions to maintain calcium homeostasis by inhibiting osteoclasts, the cells that break down bone tissue(4).

Journal of Health and Rehabilitation Research 2791-156X JHRR

A key manifestation of thyroid dysfunction is goiter, characterized by an enlargement of the thyroid gland. This condition manifests in various forms, each with distinct features and etiologies(5). The understanding of these types is critical for both medical practitioners and the general public for effective recognition and management(6). The diffuse goiter, for instance, involves a uniform swelling of the entire gland, giving it a smooth texture(7). In contrast, nodular goiter is characterized by the formation of solid or fluid-filled lumps known as thyroid nodules within the gland. This category further divides into uninodular, with a single nodule, and multinodular, featuring multiple nodules(8).

The colloid goiter, often associated with iodine deficiency, highlights the importance of this mineral in thyroid hormone production(9). Its prevalence is particularly notable in regions where dietary iodine is scarce, leading to this specific goiter type. Additionally, nontoxic goiters, with their somewhat elusive etiology, are sometimes linked to the use of certain medications, such as lithium, commonly used in treating mood disorders like bipolar disorder(10, 11).

This research, centered on District Buner in Khyber Pakhtunkhwa, Pakistan, delves into the prevalence and impact of goiter in an area where data is limited(12). With recent studies indicating variable prevalence of thyroid disorders in Pakistan and ongoing public health concerns regarding iodine deficiency, this study is poised to contribute significantly to the global understanding of goiter(13, 14). Its findings are especially pertinent considering the disproportionate effect on women of reproductive age, with broader implications for maternal and child health(15).

Figure 1 Comparative Visualization of Goitre Types. This figure illustrates the distinct morphological variations observed in goitre development: (A) Diffuse Goitre, characterized by a uniform enlargement of the thyroid gland without nodules; (B) Multinodular Goitre, marked by the presence of multiple nodules and irregular thyroid enlargement; (C) Nontoxic Goitre, a form of goitre that does not result in excess thyroid hormone production; (D) Colloid Goitre, identified by the accumulation of colloid in enlarged thyroid follicles, leading to gland expansion; and (E) Nodular Goitre, defined by the presence of one or more nodules within the gland(16).

Employing epidemiological analysis and clinical examination, the study aims to unravel the prevalence and primary factors contributing to goiter in District Buner. This comprehensive approach seeks not only to provide a detailed overview of thyroid disorders in the region but also to inform health policy and intervention strategies. The ultimate goal is to enhance the management and prevention of thyroid disorders in District Buner and potentially in similar regions globally, underscoring the significance of understanding the diverse manifestations of goiter—diffuse, nodular, colloid, and nontoxic—for effective diagnosis and treatment.

MATERIAL AND METHODS

In the study conducted on the prevalence, knowledge, and awareness of goiter disorders in District Buner, Khyber Pakhtunkhwa, Pakistan, a comprehensive methodology was adopted to ensure the accuracy and reliability of the findings. District Buner, the focal area of this research, is situated between latitudes 34-9 and 34-43 N and longitudes 72-10 and 72047 E. It is geographically bounded by Swat District to the north, Malakand Agency to the west, Mardan District to the south, and the river Indus and Hazara Division to

Journal of Health and Rehabilitation Research JHRR

the east. This region is characterized by its diverse topography, ranging from an elevation of 1,200 feet in Totalai (Khudukhel) to the lofty 9,550 feet of Dosara Peak. The hilly terrain, rich in minerals, has become a significant symbol of commerce in the area(15).

The study's design was aimed at assessing the prevalence of common goiter disorders, as well as understanding the level of knowledge and awareness among the local population, particularly those experiencing abnormal thyroid conditions. The decision to focus on this specific area and topic was made after thorough consultations with experts in the field, including our academic advisor(17).

Data collection was a critical component of the research methodology. It involved a randomized approach to gather information from various hospitals and medical centers across the district. These included DHQ Dagger, Buner Medical Complex Daggar, Buner Medical Center Daggar, Rahman Medical Complex Jowar, Shah Medical Complex Pirbaba, and Tehsil Headquarter Hospital Nawagai(18). The selection of these sites was strategic, ensuring a comprehensive representation of the district's population. Each site was chosen for its potential to provide diverse data sets, encompassing various age groups, genders, and socioeconomic backgrounds(19).

For the statistical analysis, the data was meticulously processed using the Statistical Package for the Social Sciences (SPSS). This robust analytical tool enabled us to dissect and interpret the collected data effectively. The analysis focused on various parameters: the ratio of goiter disorder incidence in the district, the common areas affected by goiter disorders, age-wise prevalence, and the underlying causes and modes of transmission of these disorders. This multi-faceted approach to data analysis was essential in drawing comprehensive conclusions about the state of goiter disorders in District Buner(11).

RESULTS

This dual-axis chart effectively conveys the numeric and relative prevalence of goiter within the district, allowing for immediate visual comparison across regions. The data labels enhance readability, ensuring that specific values can be quickly discerned without referring to the axis scale, thus providing a detailed snapshot of the health landscape in this region of Pakistan.

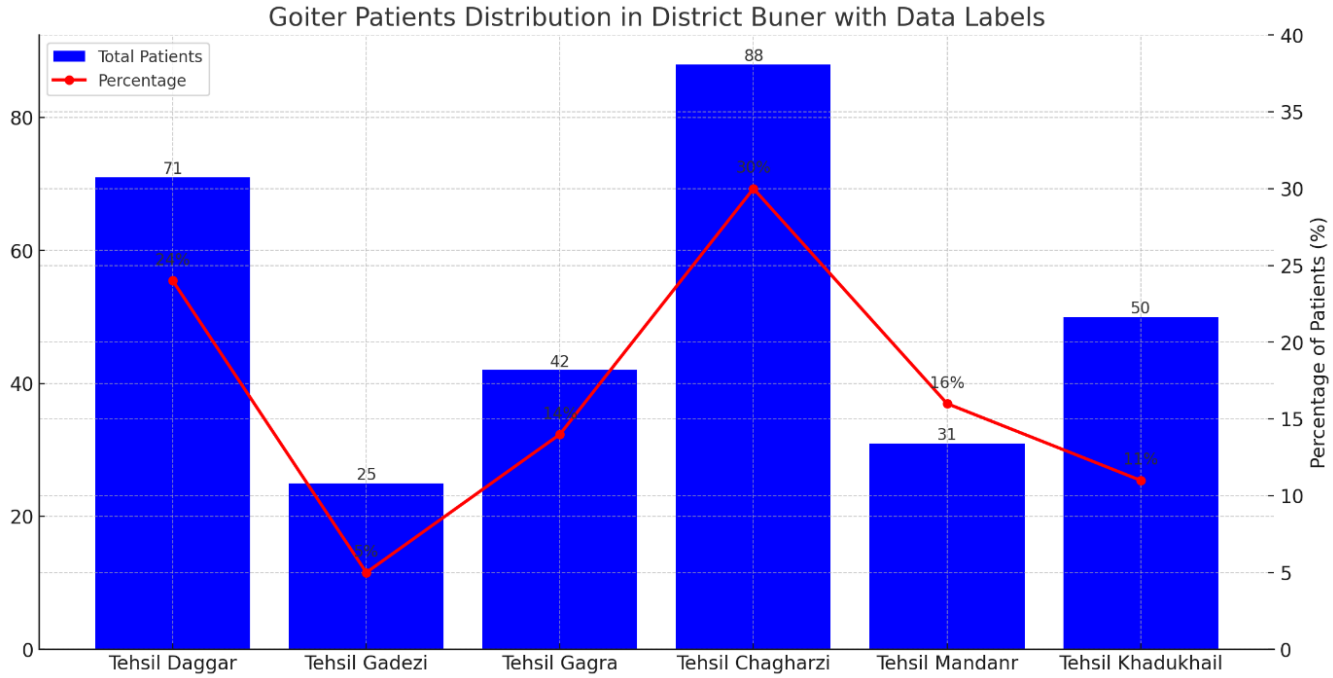

Figure 2 Goitre Patients Districtwide Distribution

The updated chart provides a comprehensive visualization of the goiter patient distribution across various tehsils of District Buner. In a clear and cohesive format, the blue bars represent the total number of patients, with precise figures denoted at the top of each bar, showing that Tehsil Chagharzi has the highest number of cases at 88 patients. Overlaying this is a red line graph, marked with percentages that signify the proportion of goiter cases per tehsil relative to the entire district, with Tehsil Chagharzi again standing out at 30%.

Table 1 Types of Goitre and Prevalence among Various Age Groups

S. No.	Types of Goiter	No of Patients	Male Count	Male %	Female Count	Female %	Age of Patients	Age Group %

Journal of Health and Rehabilitation Research 2791-156X JHRR

1	Diffuse Goiter	4	0	0%	4	100%	20-30	0.71%
2	Nodular Goiter	76	21	27.63%	55	72.36%	30-40	26.07%
3	Colloid Goiter	12	0	0%	12	100%	40-50	30%
4	Nontoxic Goiter	95	18	18.94%	77	81.05%	50-60	24.64%
5	Uninodular Goiter	31	6	19.35%	25	80.64%	60-70	10%
6	Multinodular Goiter	65	16	24.61%	49	75.38%	70-80	8.57%

The study delineated six distinct types of goiter and their prevalence among various age groups, with a specific focus on gender distribution. A total of 4 cases of Diffuse Goiter were recorded, exclusively affecting females within the 20-30 age bracket, accounting for 0.71% of the patient cohort. Nodular Goiter was more prevalent, with 76 cases noted; 21 of these were males, making up 27.63%, and the remaining 55 were females, constituting 72.36%. These cases were most common in the 30-40 age range, representing 26.07% of the total. Colloid Goiter, with 12 cases, affected only females, predominantly in the 40-50 age group, which encompassed 30% of patients. Nontoxic Goiter presented in 95 individuals, with 18 males (18.94%) and 77 females (81.05%), mainly within the 50-60 age cohort, accounting for 24.64% of cases. Uninodular Goiter was diagnosed in 31 patients, with a male to female ratio of approximately 1:4, predominantly impacting those aged 60-70, making up 10% of the total. Lastly, Multinodular Goiter was identified in 65 patients, with 16 males (24.61%) and 49 females (75.38%), most frequently occurring in the 70-80 age group at 8.57%. This data underscores a higher female predominance in most goiter types and highlights a trend of increasing prevalence with age.

DISCUSSION

In a comparative analysis of goiter prevalence across various regions, the study conducted in District Buner, Khyber Pakhtunkhwa, Pakistan, from September 2021 to September 2022, is particularly instructive. This region-specific study involved a cohort of 280 patients spanning six tehsils, namely Daggar, Gadazi, Gagra, Chagharzi, Mandanr, and Khadukhail. Methodologically, the investigation utilized questionnaires administered by physicians, surgeons, and medical specialists, alongside weekly visits to medical and rural health centers, as well as the DHQ in Buner. This approach facilitated a comprehensive data collection process, revealing a preponderance of female patients over males, which aligns with broader patterns observed in endemic goiter regions. These patterns point towards a gender-based predisposition, particularly in areas with low soil iodine content, typically associated with hilly terrains.

The symptomatology of goiter, encompassing neck lumps, tightness, hoarseness, vein swelling, and dizziness, underscores the physiological impact of this condition. In contrast to Kohat district, where male prevalence was slightly higher than females, the Buner district displayed a stark disparity, with female cases constituting 78% of the total. Notably, the highest prevalence was observed in the 70-year age group for males and the 50-year age group for females, marking a divergence from trends in Kohat and mirroring the findings from Timergara (Dir Lower), where females also manifested higher rates of goiter(15).

The study's results corroborate the hypothesis that goiter is more common in hilly areas, a finding consistent with the elevated numbers in Dir Lower and Buner, as opposed to plain regions. This observation is attributed to iodine deficiency due to the low iodine content in the soil of high-altitude areas. In Buner, a significant number of married individuals were affected, indicating potential familial or lifestyle factors contributing to the disease's prevalence. The age distribution further revealed that the majority of cases were concentrated between 30 to 60 years, pointing to an age-related increase in vulnerability(20).

Comparing this study with research from Nepal, which enrolled 2248 participants, and Saudi Arabia, with 339 patients, it becomes evident that gender disparity in goiter prevalence is a common thread, with females consistently showing higher rates than males. Moreover, the presentation of symptoms, particularly in multinodular goiter cases, suggests a pattern of increased severity and symptom manifestation, such as difficulty swallowing, which was noted in the Buner district(4, 21).

Biochemically, the study observed that mean levels of thyroid hormones T3 and T4 were significantly higher in the study group, indicating a hyperactive thyroid state in many patients. This hormonal imbalance underscores the complex pathophysiology of goiter and suggests a need for nuanced treatment approaches. The study also noted that while serum TSH concentrations were higher in the study group, a clear delineation between neoplastic and non-neoplastic thyroid diseases was necessary to tailor treatment strategies effectively.

Journal of Health and Rehabilitation Research 2791-156X JHRR

CONCLUSION

In conclusion, the study in District Buner presents a microcosm of goiter prevalence and its demographic distribution, with significant implications for public health interventions in similar endemic regions. The findings highlight the necessity for targeted educational and nutritional interventions to mitigate the risk factors associated with goiter, especially in hilly areas with inherent iodine deficiency. As goiter remains a significant health challenge, the study's insights into age and gender prevalence, symptomatology, and biochemical markers contribute valuable knowledge to the medical community's understanding of this endocrine disorder, providing a foundation for future research and health policy development.

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