

Pituitary Adenoma Prevalence and Characteristics of Omani Patients: A Single Center Experience

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ABSTRACT

Objectives: To estimate the incidence of pituitary adenomas (PA) in adult Omani patients and describe its epidemiological, clinical, and radiological characteristics.

Methods: In this longitudinal, descriptive study, we reviewed the records of all PA patients from January 2015 to January 2020 who presented at the endocrinology facilities at Sultan Qaboos University Hospital, Muscat. **Results:** The participants comprised of 112 Omani patients with PA. The incidence of PA among all adult patients at Sultan Qaboos University Hospital (inpatient and outpatient) over five years (2015–2020) was 0.23%. The cohort had a mean age of 41.0 ± 15.0 years. Of the 112 patients included in this study, 79 (70.5%) were women. Nearly half (51; 45.5%) of adenomas were prolactinomas while 46 (41.1%) were non-functioning adenomas, and seven (6.3%) were growth hormone-secreting adenomas while six (5.4%) were adrenocorticotrophic hormone secreting adenomas. Headache was present in 67 (59.8%) patients, followed by visual field defects (40; 35.7%), galactorrhea (26; 23.2%), and fatigue (19; 17.0%). The majority of women (45/79; 57.0%) presented with menstrual cycle abnormalities. Radiological appearances were nearly equally distributed between micro- and macroadenomas. Most cases (58/112; 52.0%) of PA were treated medically by cabergoline, octreotide, and replacement therapies such as hydrocortisone and thyroxin, 38 (33.9%) were treated surgically (mainly by transphenoidal pituitary resection), and the remaining 10 (8.9%) cases were subjected to radiotherapy. Medical treatment combined with surgery was employed for 15 (13.4%) patients. **Conclusions:** In our investigation, PA was primarily prevalent among Omani female patients, and the most common subtype of pituitary tumors was prolactinomas. The most common presentation symptom was headaches; most female patients had menstrual irregularities. Medical treatment was the primary approach for the applicable types of PAs, while surgery and radiotherapy were found to be secondary and tertiary treatment options, respectively.

Pituitary adenomas (PA) are the most common sellar mass lesions, accounting for 15% of all intracranial tumors.¹ Most (60–70%) cases secrete excess hormones. The remaining 25–35% tend to be non-functioning (silent) tumors.²

One of the first attempts to estimate the prevalence of PA in autopsy samples was in 1936, when it was found in 22.5% of unselected cases, which included individuals who did not exhibit PA symptoms.³ Later, radiological studies identified PA in asymptomatic individuals at a high prevalence rate of 10–38%.⁴ Furthermore, the prevalence of PA in tertiary referral centers was estimated to be around

190–280 per million in the UK and about 190 per million in Italy.⁵

The prevalence of PA in the general population varies by age and sex. In males over the age of 70, PA is more prevalent than in females. Below the age of 50 years, however, there is a female predominance, with peak incidence in 20–39-year-old women. For men, the peak incidence is between 50 and 60 years.⁶

This study aimed to assess the incidence of PA among adult Omani inpatients and outpatients (aged > 20 years). The significance of the study lies in the fact that estimating the incidence of PA is crucial for understanding the disease burden in Oman. Additionally, it can aid in reducing PA-

related morbidity and mortality rates and enhancing patient management.

METHODS

All patients who presented with PA to the clinic or ward or were referred to the Endocrinology Clinic at Sultan Qaboos University Hospital (SQUH) between January 2015 and February 2020 were included in this longitudinal study. Patient data were retrieved from the SQUH database. Patients' identification numbers were coded to maintain confidentiality. The analysis did not interfere with the patient's management. The data analyzed included demographic information (age, sex, area of residence), comprehensive clinical evaluation, hormonal levels, treatment plan, and radiological indications of the pituitary mass lesion using magnetic resonance imaging scans conducted at SQUH or other health facilities.

Descriptive statistics were used to describe the data. The data was analyzed using IBM SPSS Statistics (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.). Mean and SDs were reported for continuous variables, whereas categorized variables were analyzed and presented as frequencies and percentages. The results were used to estimate the incidence of non-functional PA in patients admitted to SQUH using the number of patients with PA and the total number of patients with abnormal pituitary function test and had done magnetic resonance imaging of the pituitary fossa.

Epidemiological characteristics of patients, presenting symptoms received, and mortality rates were analyzed as different variables in SPSS.

Ethical approval was obtained from the Medical and Research Ethics Committee at Sultan Qaboos University, Muscat, Oman (MERC#:2158).

RESULTS

Over the five-year study period (2015–2020), a total of 112 patients with PA, representing a diverse mix of the Omani population, were included in this study. The overall mean age of the cohort was 41.0 ± 15.0 years, ranging from 20 to 96 years. The majority of the patients were female (79; 70.5%). The most common subtype of pituitary tumors in the cohort was prolactinomas (51; 45.5%), followed by non-functioning adenomas (46; 41.1%), growth hormone (GH)-secreting adenomas (7; 6.3%), and adrenocorticotrophic hormone (ACTH)-secreting PA (6; 5.4%). The overall incidence of PA was 0.2%, representing one case of PA per 434 patients who were admitted to the hospital's endocrine clinic with abnormal pituitary function tests.

Patients with the most common pituitary tumors differed significantly in age [Table 1]. Patients with GH-secreting PA were older (mean = 54.0 years) than those with non-functioning adenomas (44.0 years) prolactinomas (38.0 years), and ACTH-secreting PA (31.0 years). Microadenomas constituted 57 (50.9%) of cases, and macroadenomas comprised the rest (55; 49.1%). Subjects with non-functioning adenomas and GH-secreting PA were more likely to have macroadenomas than those with either prolactinoma or ACTH-secreting PA [Table 1].

The most prevalent specific clinical manifestation of PA was headache (67; 59.8%), menstrual irregularities in women (45/79; 57%), visual field defects (40; 35.7%), galactorrhea in women (26/79; 23.2%), and fatigue (19; 17.0%) [Table 2]. Menstrual irregularities were more associated with women with prolactinomas (27/40; 67.5%) and non-functioning adenomas (16; 57.1%) than those with GH-secreting PA or ACTH-secreting PA. Galactorrhea was mostly associated with women with prolactinomas (21; 41.2%) than those with non-functioning adenomas.

Table 1: Demographic and tumor characteristics of the four most prevalent pituitary tumors in the evaluated cohort.

Characteristics	NFPA (n = 46)	Prolactinoma (n = 51)	GH-secreting PA (n = 7)	ACTH-secreting PA (n = 6)	All adenomas (N = 112)
Mean age, years	44.0 ± 17.0	38.0 ± 9.0	54.0 ± 24.0	31.0 ± 12.0	41.0 ± 15.0
Male, n (%)	18 (39.1)	11 (21.6)	3 (42.9)	1 (16.7)	33 (29.5)
Female, n (%)	28 (60.9)	40 (78.4)	4 (57.1)	5 (83.3)	79 (70.5)
Microadenoma, n (%)	18 (39.1)	29 (56.9)	2 (28.6)	3 (50.0)	57 (50.9)
Macroadenoma, n (%)	28 (60.9)	22 (43.1)	5 (71.4)	3 (50.0)	55 (49.1)

NFPA: non-functioning pituitary adenomas; GH: growth hormone; ACTH: adrenocorticotrophic hormone.

Table 2: Clinical presentation of the four most prevalent pituitary tumors in the evaluated cohort.

Feature	NFPA (n = 46) F = 28	Prolactinoma (n = 51) F = 40	GH-secreting PA (n = 7) F = 4	ACTH-secreting PA (n = 6) F = 5	All adenomas (N = 112) F = 79
Headache, n (%)	26 (56.5)	36 (70.6)	3 (42.9)	2 (33.3)	67 (59.8)
Fatigue, n (%)	9 (19.6)	6 (11.8)	2 (28.6)	1 (16.7)	19 (17.0)
Visual field defects, n (%)	16 (34.8)	20 (39.2)	1 (14.3)	2 (33.3)	40 (35.7)
Menstrual cycle abnormality in women, n (%)	16 (57.1)	27 (67.5)	1 (25.0)	1 (20.0)	45 (57.0)
Galactorrhea in women, n (%)	5 (10.9)	21 (41.2)	0 (0.0)	0 (0.0)	26 (23.2)
Hypopituitary symptoms, n (%)	8 (17.4)	4 (7.8)	0 (0.0)	0 (0.0)	12 (10.7)
Other neurological signs, n (%)	28 (60.9)	37 (72.5)	3 (42.9)	2 (33.3)	70 (62.5)

NFPA: non-functioning pituitary adenomas; F: female; GH: growth hormone; ACTH: adrenocorticotrophic hormone.

Hypopituitary symptoms were more associated with those with non-functioning adenomas (17.4%) than those with prolactinomas (7.8%). Incidentally, detected PA accounted for six (5.3%) cases. The oldest patient diagnosed in this study was 96 years old and was incidentally found to have functional microadenomas secreting growth hormone, diagnosed as acromegaly, and was treated with octreotide.

In this series, we did not note any spontaneous resolution of tumors. Several therapeutic options were used for the treatment of the different pituitary tumors. These included medical treatment, surgery, medical plus surgery, and radiotherapy [Table 3]. PAs were treated medically with cabergoline and octreotide. Hydrocortisone and thyroxine were used as replacement therapy. Surgery was indicated for macroadenomas with visual disturbance and symptomatic non-functional adenomas with symptoms due to compression effects. The therapeutic options included medical treatment (58; 51.8%), surgery (38; 33.9%), medical treatment plus surgery (15; 13.4%), and radiotherapy (10; 8.9%).

Patients with prolactinoma were mostly treated medically (43/51; 84.3%), and on a lesser extent surgically (10; 19.6%). Surgical intervention was indicated in patients with GH-secreting PA (6/7; 85.7%), ACTH-secreting PA (5/6; 83.3%), and non-functioning adenomas (20/46; 43.5%). Some patients with non-functioning adenomas were treated by radiotherapy as a post-operative treatment to prevent recurrence (7/46; 15.2%).

DISCUSSION

Epidemiological studies are essential for accurately quantifying disease incidence, severity, and healthcare resource utilization. This study aimed to investigate the incidence of PA in adult Omani patients by analyzing hospital records of 112 patients over a five-year study period. The mean age of our cohort was 41.0 years, which is consistent with the findings of a study conducted in Iceland (44 years).⁷ However, a previous study conducted in Oman in 2007 reported a mean age of 33 years.⁸

Table 3: Therapeutic modalities of the four most prevalent pituitary tumors in the tested cohort.

Therapeutic option	NFPA (n = 46) F = 28	Prolactinoma (n = 51) F = 40	GH-secreting PA (n = 7) F = 4	ACTH-secreting PA (n = 6) F = 5	All adenomas (N = 112) F = 79
Medical, n (%)	4 (8.7)	43 (84.3)	5 (71.4)	3 (50.0)	58 (51.8)
Surgery, n (%)	20 (43.5)	10 (19.6)	6 (85.7)	5 (83.3)	38 (33.9)
Medical + surgery, n (%)	3 (6.5)	6 (11.8)	4 (57.1)	2 (33.3)	15 (13.4)
Radiotherapy, n (%)	7 (15.2)	3 (5.9)	1 (14.3)	1 (16.7)	10 (8.9)

NFPA: non-functioning pituitary adenomas; F: female; GH: growth hormone; ACTH: adrenocorticotrophic hormone.

The prevalence and occurrence of non-functioning pituitary adenomas (NFPA) have been rising in recent years, with a relative reduction in other subtypes.⁹ This can be attributed to the current advances in imaging facilities, which have led to the discovery of incidentalomas, most of which are NFPA,⁸ that as typically non-secreting tumors, and are not detected till they grow and cause compression symptoms. This also may explain the higher incidence of microadenomas observed in post-mortem studies.¹⁰ Prolactinomas predominantly presented as microadenomas with an early presentation of hormonal changes and abnormal menstrual irregularities in females.^{8,11}

In our cohort, the incidence of PA was higher in women (70.5%) than in men (29.5%), which was consistent with previous studies conducted in Oman's neighboring countries. In a study conducted in a community-based hospital in Saudi Arabia, 71.9% of PA patients were female.¹² In a recent study in the UAE, females constituted 62.5% of the cohort.¹³ This female predominance may be attributed to potential hormonal fluctuations throughout life.

In subtype classification, prolactinomas were the most common in our cohort (45.5%), followed by NFPA (41.1%), GH-secreting PA (6.3%), and ACTH-secreting PA (5.4%). Previous clinical prevalence studies also identified prolactinomas as the most common subtype.¹³⁻¹⁵ However, our findings contradict a study in Iceland that reported a higher incidence of NFPA (43.1%) than prolactinoma (39.9%).⁷ Additionally, an earlier study reported a higher incidence of NFPA (50.6%) than prolactinoma (36.9%).¹⁰ Moreover, the incidence of GH-secreting PA (11.2%) was almost double compared to our observation.⁷ In comparison to a previous study conducted in Oman by Al-Futaisi et al,⁸ the incidence rate of NFPA reduced from 50.6% to 41.1% in our study.

In this study, NFPA were predominantly macroadenomas (60.9%). Comparable results were reported from Iceland, where non-functioning pituitary macroadenomas accounted for 74.4% of cases.⁷ The likely explanation for the higher incidence of these non-functioning pituitary macroadenomas could be their asymptomatic behavior until they enlarge and present with compression symptoms, which may also explain the higher incidence of microadenomas in post-mortem studies.¹⁰

On the other hand, the predominance of microadenomas (56.9%) among our patients was possibly due to their early presentation of hormonal changes and abnormal menstrual cycles in women. These results are consistent with the findings of previous studies (57.4%, 86%).^{8,16}

In our cohort, the primary clinical manifestations were headache, menstrual irregularities, and visual field defects. Studies conducted in the UK and UAE have also shown that one of the most frequent presentations was headache.^{13,14} Prolactinomas were the most frequent adenomas in our female patients (n=51). They were mainly associated with menstrual irregularities (52.9%) such as amenorrhea, oligomenorrhea, and galactorrhea (41.2%), which concurs well with previously reported studies in which the most prevalent symptoms were amenorrhea-galactorrhea (84.7%) for patients with prolactinomas.^{10,13} A minority (17.4%) of our patients reported symptoms of hypopituitarism with non-functioning adenomas, which is also almost consistent with previous findings of 8.7%.⁸

Among the therapeutic modalities, our results showed that the most common option used was medical treatment (51.8%), followed by surgery (33.9%), medical plus surgery (13.4%), and lastly, radiotherapy (8.9%). Although in a lower percentage, similar management strategies were reported previously including medical treatment (39%), required surgery (21%), and surgery plus medical (2%).⁸ Our results differ from those of a study conducted on a Swedish cohort which reported a higher rate of surgical management (55%) followed by medical therapy (45%) and radiotherapy (< 1%).¹⁷ Our findings and the Swedish study's findings showed that a small percentage of patients received radiotherapy. Radiotherapy was the standard treatment option for patients with PAs until the late 1980s when it was found to increase the chance of secondary tumor development and cognitive impairment.¹⁸

CONCLUSION

In this study, PA patients were predominantly women, and the most common subtype was prolactinomas. The commonest presentation symptoms were headaches and menstrual irregularities. The patients were mainly treated medically, followed by surgery and radiotherapy. This study presents up-to-date PA

incidence rates at a single center, as well as a detailed overview of its various subtypes. Our study affirms recent findings elsewhere and provides a detailed examination of the epidemiology of PA in a well-defined population.

Disclosure

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