International Journal of Neurosurgery
2022; 6(2): 99-103
http://www.sciencepublishinggroup.com/j/ijn
doi: 10.11648/j.ijn.20220602.22
ISSN: 2640-1940 (Print); ISSN: 2640-1959 (Online)

Epidemiology of Pituitary Adenomas Operated at the University Hospital Center Yalgado Ouedraogo

Yameogo Wendlasida Serge Pacome Arnauld[1, *], Zabsonre Denlewende Sylvain[2], Biogo Wend Toin Joseph[1], Kabre Abel[2]

[1]Department of Neurosurgery, Regional University Hospital Center of Ouahigouya, Ouahigouya, Burkina Faso

[2]Department of Neurosurgery, University Hospital Center Yalgado Ouedraogo, Ouagadougou, Burkina Faso

Email address:

pacomesergey@yahoo.fr (Yameogo Wendlasida Serge Pacome Arnauld), szabsonre@gmail.com (Zabsonre Denlewende Sylvain), joseph_biogo@yahoo.fr (Biogo Wend Toin Joseph), kabrel@yahoo.fr (Kabre Abel)

[*]Corresponding author

To cite this article:

Yameogo Wendlasida Serge Pacome Arnauld, Zabsonre Denlewende Sylvain, Biogo Wend Toin Joseph, Kabre Abel. Epidemiology of Pituitary Adenomas Operated at the University Hospital Center Yalgado Ouedraogo. *International Journal of Neurosurgery*. Vol. 6, No. 2, 2022, pp. 99-103. doi: 10.11648/j.ijn.20220602.22

Received: October 11, 2022; **Accepted**: October 29, 2022; **Published**: November 10, 2022

Abstract: *Background*: Pituitary adenomas are benign tumors whose incidence and/or prevalence are difficult to assess in the general population. Our objective was to determine the epidemiological data of pituitary adenomas from hospital data. Methods: A cross-sectional study (01 January 2006-31 December 2018) was carried out in the department of neurosurgery of the university hospital center-Yalgado OUEDRAOGO. Patients operated for a pituitary adenoma and having a medical record and anatomopathological confirmation were included in the study. Data were entered and processed using EXCEL 2013 software and Stata13 software. Fischer's exact test was used. A P-value <0.05 was considered a statistically significant difference. Results: The average annual number of patients was 3.92. The average age was 44.55 years. It was found a female and male predominance respectively before and after the age of 40 years. The pituitary adenoma was non-functional in 34 patients including 24 men. The pituitary adenoma was functional in 17 cases including 14 women. Immunostaining was positive at 1, 2 and 3 hormonal axis (es) in 17 cases, 4 cases and 1 case respectively. It was negative in 3 cases. Conclusions: The frequency of pituitary adenomas increases with age in men and vice versa in women. Nonfunctional and functional pituitary adenomas are common in men and women, respectively.

Keywords: Epidemiologic Study, Functional Pituitary Adenoma, Non-Functional Pituitary Adenoma

1. Introduction

Pituitary adenomas are benign tumors developed from the parenchymal cells of the anterior pituitary [1, 2]. They occupy an important place among pituitary pathologies. Their manifestations are sometimes insidious. Their diagnosis is most often late [3]. Cerebral computed tomography and magnetic resonance imaging provide a good diagnostic approach. Pathology anatomy confirms the diagnosis [1, 4–7]. Thereby, the incidence and/or prevalence of pituitary adenomas are difficult to assess in the general population [1, 3–6]. This prevalence varies between 10.7 % and 38% depending on the studies [4, 6, 7]. In Burkina Faso, to date there is no published study on the epidemiological data of pituitary adenomas. The objective of our study was to determine the epidemiological data of pituitary adenomas from hospital data from the department of neurosurgery of the University Hospital Center Yalgado OUEDRAOGO.

2. Materials and Methods

This study was carried out in the department of neurosurgery of the university hospital center-Yalgado OUEDRAOGO. It is in this department that the surgical management of pituitary adenomas is effective in Burkina Faso. The service had 2 neurosurgeons from 2006 to 2011, 03 from 2011 to 2015, 4 from 2015 to 2018 and 5 from 2018; an operating room for scheduled surgical activities, a microscope

and an operating endoscope. This was a cross-sectional study over a period of 13 years from January 1, 2006 to December 31, 2018. Three thousand six hundred and twenty-five (3625) surgical procedures took place during this period. Seventy-one (71) patients operated for the diagnosis of a pituitary adenoma evoked on the basis of computed tomography or cerebral Magnetic Resonance Imaging constituted the study population. The patients who were included in our study are those who had a medical record and anatomopathological and/or immunohistochemical confirmation of the diagnosis of pituitary adenoma. Immunonegative adenomas were considered as gonadotropic pituitary adenomas. These criteria enabled us to retain 51 cases (71.83%) and to exclude 20 cases (28.17%). Immunohistochemical examination was performed in 25 patients (49.02%). According to the clinical signs, the cases were grouped into functional pituitary adenoma and non-functional pituitary adenoma. Revision surgery for pituitary adenoma was performed in 3 cases, bringing the number of surgical procedures for pituitary adenoma to 54. An individual data collection sheet was developed and served as a collection tool. Data were entered on EXCEL 2013 software and processed on a computer using Stata13 software in its SE-64 version. The results were analyzed using Fischer's exact test. P-value <0.05 was considered to indicate a statistically significant difference. Our study was conducted with strict respect for the anonymity of the patients and the confidentiality of the information collected.

3. Results

The frequency of pituitary adenoma surgery in the neurosurgery department was 54/3625 or 1.49% of cases.

The average number of patients per year was 3.92 with extremes of 02 patients/year and 08 patients/year. The average age was 44.55 years with extremes of 22 years and 78 years. Twenty-five (49.02%) patients were between 40 and 60 years old. 62.5% of women were under 40 years old. The sex ratio (male/female) was 1.125. It was respectively 0.333, 2.125 and 5.000 for patients under 40 years old, for the age group (in years) [40-60] and patients over 60 years old. A female predominance was found before the age of 40, and a male predominance after the age of 40. Table 1 summarizes the distribution of patients according to sex and age.

Table 1. *Distribution of patients according to sex and age.*

Sex	Age (year)			Total
	[20-40]	[40-60]	>60	
Male				
1	5	17	5	27
2	18.52	62.96	18.52	100.00
Feminine				
1	15	8	1	24
2	62.50	33.33	4.17	100.00
Total				
1	20	25	6	51
2	39.22	49.02	11.76	100.00

1 = Absolute frequency (effective); 2 = Percentage of line
Fisher's exact = 0.004

Patients' professions were formal sector employees (n = 18 or 35.30%), housewives (n = 14 or 27.45%), informal sector employees (n = 9 or 17.65%), retired formal sector employees (n = 5 or 9.80%), cultivators (n = 3 or 5.88%) and students (n = 2 or 3.92%).

The pituitary adenoma was nonfunctional in 34 patients (66.67%) and functional in 17 patients (33.33%). Among the cases of non-functioning pituitary adenoma, 24 (70.59%) cases were males and 10 (29.41%) cases were females. Table 2 summarizes the distribution of patients by sex depending on whether the pituitary adenoma is functional or not.

Table 2. *Distribution of patients by sex depending on whether or not the pituitary adenoma is functional.*

Sex	Endocrine sign (s)		Total
	No	Yes	
Male			
1	24	3	27
2	88.89	11.11	100.00
3	70.59	17.65	52.94
Feminine			
1	10	14	24
2	41.67	58.33	100.00
3	29.41	82.35	47.06
Total			
1	34	17	51
2	66.67	33.33	100.00
3	100.00	100.00	100.00

1= Absolute frequency (Count) 2= Row percentage 3= Column percentage
Fisher's exact = 0.001

Among the cases of functional pituitary adenoma, the number of men and women was respectively 3 and 14 cases. Table 3 summarizes the distribution of patients according to sex and type of functional pituitary adenoma.

Table 3. *Distribution of patients according to sex and type of functional pituitary adenoma.*

Sex	Endocrine signs				Total
	GH	PRL	GH+PRL	GH+PRL+ ACTH	
Male	3	0	0	0	3
Feminine	3	7	3	1	14
Total	6	7	3	1	17

GH: Acromegaly; PRL: Prolactinoma; ACTH: Cushing's Syndrome
Fisher's exact = 0.110

Immunostaining was positive for 1 hormonal axis in 17 cases including 10 cases of gonadotropic adenoma, 5 cases of prolactinoma, 2 cases of somatotropic adenoma. It was positive for 2 hormonal axes in 4 cases including 2 cases of association of somatotropic and corticotroph adenoma, and 2 of association of somatotropic and prolactin adenoma. It was positive for 3 hormonal axes (somatotropic, gonadotropic and prolactin) in 1 case. Immunolabeling was negative in 3 cases. Immunohistochemical examination was performed in 17 cases of non-functional pituitary adenoma and 8 patients with functional adenoma. Table 4 summarizes the distribution of cases according to the functional character or not of the pituitary adenoma and the results of the immunohistochemistry.

Table 4. *Distribution of cases according to the functional character or not of the pituitary adenoma and the results of the immunohistochemistry.*

Endocrine signs	Result of immunohistochemistry of pituitary adenoma						Total
	FSH/LH	PRL	GH	GH+ACTH	GH+PRL	GH+FSH/LH+PRL	
No	13	2	0	1	0	1	17
Yes	0	3	2	1	2	0	8
Total	13	5	2	2	2	1	25

FSH/LH: Gonadotropic adenoma
PRL: Prolactin adenoma
GH: Somatotropic adenoma
GH + ACTH: Somatotropic + Corticotropic adenoma
GH+PRL: Somatotropic +Prolactin adenoma
GH+FSH/LH+PRL: Somatotropic +Gonadotropic+Prolactin adenoma
Fisher's exact = 0.000

The cases of gonadotropic adenomas were divided into 10 men and 3 women. Table 5 summarizes the distribution of cases according to sex and the results of immunohistochemistry of pituitary adenoma.

Table 5. *Distribution of cases according to sex and results of immunohistochemistry of pituitary adenoma.*

Sex	Result of immunohistochemistry of pituitary adenoma						Total
	FSH/LH	PRL	GH	GH+ACTH	GH+PRL	GH+FSH/LH+PRL	
No	10	2	1	0	0	1	14
Yes	3	3	1	2	2	0	11
Total	13	5	2	2	2	1	25

FSH/LH: Gonadotropic adenoma
PRL: Prolactin adenoma
GH: Somatotropic adenoma
GH + ACTH: Somatotropic + Corticotropic adenoma
GH+PRL: Somatotropic +Prolactin adenoma
GH+FSH/LH+PRL: Somatotropic +Gonadotropic+Prolactin adenoma
Fisher's exact = 0.059

4. Discussion

We collected 51 patients over a period of 13 years. The average number of patients per year was 3.92 patients/year. Our results are similar to hospital data of TAGOE et. al. [8] in Ghana (4.8 patients/year), ELOUNDOU NGAH et al. [9] in Cameroon (2.04 patients/year), ZUNON-KIPRE et al. in Ivory Coast (3.67 patients/year) [10]. This number is higher in hospital data from developed countries. TJORNSTRAND et al. [7] in Sweden and ZHANG et al. [11] in China included in their study respectively 39.18 patients/year and 118.5 patients/year. Several factors could explain this result in our context: the underdiagnosis of the pathology linked to the accessibility of imaging and endocrine hormone assays, the insufficient number of endocrinologists and neurosurgeons, and the inadequacy of the technical platform due to a single operating room for all scheduled neurosurgical activities; the prevalence of pituitary adenoma surgery being 1.49%.

The sex ratio was 1.125 in our study. Our results are similar to those of ABODO et al. [12] in Ivory Coast and BILUTS H et al [13] in Ethiopia who respectively found a sex ratio of 20 Men (M)/18 Women (F) or 1.1 and 16M/14F or 1.14. ELOUNDOU NGAH et al. [9] in Cameroon found a female predominance with 7M/9F or 0.7. For KALININ et al. [14] in Russia, pituitary adenomas affect both men and women. However, the value of the sex ratio increased in the same direction as age (p=0.004). TJORNSTRAND et al. [7] in Sweden made the same observation in their study. The frequency of pituitary adenomas increased with age in men and vice versa in women. GITTLEMAN et al. [15] in the USA reported a high incidence in women for patients aged 0 to 50 years, an almost similar incidence in men and women aged 50 to 54, and a high incidence in men for patients aged over 54 years old.

The average age was 44.55 years and the most affected age group was between 40 and 60 years (p=0.004). ELOUNDOU NGAH et al. [9] in Cameroon and CHENG et al [16] in China found an average age of 40 and 37 years respectively. There was a female predominance in their study. SINGH et al. [17] in India found in their study an average age of 46.43 years and a male predominance. Our results can be superimposed on those of the meta-analysis carried out by ALMUTAIRI et al. [18] in the USA, who reported the average age of operated patients to be between 31.6 and 63.5 years. However, we notice that the average age is higher in the predominantly male series compared to the predominantly female ones. This could be explained by the fact that the diagnosis of pituitary adenomas in women is made at a young age [7]. In addition, functional and non-functional pituitary adenomas were respectively more frequent in women and in men in our study. This could be explained by the fact that non-functional pituitary adenomas are more important in elderly male subjects and that prolactinomas are frequently encountered in young women [7, 15, 19].

In our series, 62.5% of women were under 40 years old. Our results are comparable to those of DIOP et al. [20] in Senegal

who reported in their study patients aged 20 to 38 years.

Employees (35.30%) were the most represented in our study. DEB et al. [21] in the USA concluded in their study that socioeconomic status could be associated with a high probability of receiving surgical treatment for pituitary adenoma. The fact of receiving a constant and regular financial income could facilitate better planning of the patient for his care.

The frequency of non-functional pituitary adenomas (66.67%) was higher than that of functional pituitary adenomas (p=0.001). LEE et al. [22] in Korea and TJORNSTRAND et al. [7] in Sweden also reported a predominance of non-functional pituitary adenomas with respectively 82.35% and 54% of cases. Our results are however different from those of DAY et al. [4] in Argentina who reported a predominance of functional pituitary adenomas with a percentage of 78.03%. The proportion of women in their study was 73.3% and the average female age was 34.1 years. The male/female ratio of the study population could influence the proportion of pituitary adenomas depending on whether they are functional or not.

In our study, the functional clinical signs of pituitary adenomas were dominated by the prolactin hormonal syndrome, followed by the somatotropic hormonal syndrome and the corticotropic hormonal syndrome associated with the two previous ones (p=0.110). No thyroid-stimulating hormonal syndrome was observed. DAY et al. [4] made the same observation in their study. In the literature, the hormonal syndrome includes, in order of frequency, the prolactin hormonal syndrome, the somatotropic hormonal syndrome and the corticotropic hormonal syndrome. Thyrotropic hormonal syndrome and gonadotropic hormonal syndrome are rare [23]. Gonadotropic pituitary adenomas are usually not responsible for any clinical manifestation [24].

On immunohistochemical examination, immunostaining was negative in 3 cases. Mete et al [25] found 4.5% immuno-negative pituitary adenoma. Immune-negative pituitary adenomas not reacting with any antibody are currently very rare (<5%). It would be an undifferentiated form of gonadotropic adenoma [26]. It is for this reason that we considered immunonegative pituitary adenomas as gonadotropic pituitary adenomas. Among non-functioning pituitary adenomas, gonadotropic pituitary adenoma was the most common (p=0.000). ZUNON-KIPRE et al [10] in Ivory Coastwho reported 81.8% of gonadotropic adenomas among non-functional pituitary adenomas. Gonadotropic pituitary adenomas are usually not responsible for any clinical manifestation [24]. A male predominance was observed among the cases of gonadotropic pituitary adenoma (p=0.059). METE et al [25] found 63% men among gonadotropic pituitary adenomas.

5. Conclusions

In our context, the frequency of pituitary adenomas increases with age in men and vice versa in women. The diagnosis of non-functioning pituitary adenomas is more frequent in men and that of functioning pituitary adenomas is more frequent in women. This is most often a pituitary hormonal axis.

6. Recommendations

This study was carried out during a period when the number of practitioners (neurosurgeon, endocrinologist, pathologist, etc.) was very low and neurosurgical activity was continuous in a single hospital in the country. This situation influenced the size of our sample. Nowadays, neurosurgical practice is done in other hospitals and the number of practitioners has increased considerably. A future evaluation on the epidemiology of pituitary adenomas in Burkina Faso could take place in this new context.

Consent for Publication

Written informed consent was obtained from all the patient for the use of their data for any study. Patients enrollment to this study was retrospectively registred. Data collected for this study come from the routine data of the department of neurosurgery of the university hospital center-Yalgado OUEDRAOGO.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Authors' Contributions

YAMEOGO Wendlasida Serge Pacôme Arnauld, ZABSONRE Denlewende Sylvain, and KABRE Abel have given substantial contributions to the conception or the design of the manuscript, YAMEOGO Wendlasida Serge Pacôme Arnauld and BIOGO Wend Toin Joseph to acquisition, YAMEOGO Wendlasida Serge Pacôme Arnauld to analysis and interpretation of the data. All authors have participated to drafting the manuscript. All authors read and approved the final version of the manuscript.

Acknowledgements

Thanks to Sedera Radoniaina RAKOTONDRASAO who provided help during the research.

References

[1] Chin SO. Epidemiology of Functioning Pituitary Adenomas. Endocrinol Metab (Seoul). 2020; 35 (2): 237-42.

[2] Maldaner N, Serra C, Tschopp O, Schmid C, Bozinov O, Regli L. [Modern Management of Pituitary Adenomas - Current State of Diagnosis, Treatment and Follow-Up]. Praxis (Bern 1994). 2018; 107 (15): 825-35.

[3] Fontana E, Gaillard R. Epidemiology of pituitary adenoma: Results of the first Swiss study. Rev Med Suisse. 2009; 5: 2172-4.

[4] Day PF, Loto MG, Glerean M, Picasso MFR, Lovazzano S, Giunta DH. Incidence and prevalence of clinically relevant pituitary adenomas: retrospective cohort study in a Health Management Organization in Buenos Aires, Argentina. Arch Endocrinol Metab. 2016 Dec; 60 (6): 554-61.

[5] Aljabri KS, Bokhari SA, Assiri FY, Alshareef MA, Khan PM. The epidemiology of pituitary adenomas in a community-based hospital: a retrospective single center study in Saudi Arabia. Ann Saudi Med. 2016 Oct; 36 (5): 341-5.

[6] Jaursch-Hancke C, Deutschbein T, Knappe UJ, Saeger W, Flitsch J, Fassnacht M. The Interdisciplinary Management of Newly Diagnosed Pituitary Tumors. Dtsch Arztebl Int. 2021 Apr 9; 118 (14): 237-43.

[7] Tjörnstrand A, Gunnarsson K, Evert M, Holmberg E, Ragnarsson O, Rosén T, et al. The incidence rate of pituitary adenomas in western Sweden for the period 2001-2011. Eur J Endocrinol. 2014 Oct; 171 (4): 519-26.

[8] Tagoe NN, Essuman VA, Bankah P, Dakurah T, Hewlett VK, Akpalu J, et al. Visual Outcome of Patients with Pituitary Adenomas Following Surgery and Its Contributory Factors at a Tertiary Hospital in Ghana. Ethiopian J Health Sci. 2019 Jan; 29 (1): 895-902.

[9] Eloundou Ngah J, Eyenga VC, Ngowe Ngowe M, Atangana R, Sosso MA. Pituitary adenomas. surgical management of 16 patients in YAOUNDE CAMEROUN. AJNS. 2009; 28 (2): 55-60.

[10] Zunon-Kipre Y, Broalet E, Drogba L, Haidara A, N'da H, Bazeze V. Non-functioning pituitary adenomas: a plea for an earlier diagnosis. AJNS. 2007; 26 (2): 83-94.

[11] Zhang C, Ding X, Lu Y, Hu L, Hu G. Cerebrospinal fluid rhinorrhea following transsphenoidal surgery for pituitary adenoma: experience in a Chinese centre. Acta Otorhinolaryngol Ital. 2017 Aug; 37 (4): 303-7.

[12] Abodo J, Haidara A, Dago Pk, Kouassi F, Hue La, Lokrou A. Profile of pituitary adenomas in sub-Saharan Africa about 38 cases. Annales d'Endocrinologie. 2016; 77 (4): 368-9.

[13] Biluts H, Laeke T. Microscopic transphneoidal surgery experience from Christian Medical Center Addis Ababa Ethiopia. Ethiopian Med J 2014 Apr; 52 (2): 67-76.

[14] Kalinin PL, Kadashev BA, Fomichev DV, Kutin MA, Astaf'eva LI, Sharipov OI, et al. Surgical treatment for pituitary adenomas. Vopr neirokhir. 2017; 81 (1): 95.

[15] Gittleman H, Ostrom QT, Farah PD, Ondracek A, Chen Y, Wolinsky Y, et al. Descriptive epidemiology of pituitary tumors in the United States, 2004-2009. J Neurosurg. 2014 Sep; 121 (3): 527-35.

[16] Cheng Y, Xue F, Wang TY, Ji JF, Chen W, Wang ZY, et al. Analyzes and treatments of postoperative nasal complications after endonasal transsphenoidal resection of pituitary neoplasms. Medicine (Baltimore). 2017 Apr; 96 (15): e6614.

[17] Singh A, Grewal SS, Kumar N. Endoscopic Endo-Nasal Trans-Sphenoidal Excision of Pituitary Tumors: An Institutional Experience. Indian J Otolaryngol Head Neck Surg. 2018 Mar; 70 (1): 98-101.

[18] Almutairi RD, Muskens IS, Cote DJ, Dijkman MD, Kavouridis VK, Crocker E, et al. Gross total resection of pituitary adenomas after endoscopic vs. microscopic transsphenoidal surgery: a meta-analysis. Acta Neurochir (Wien). 2018 May; 160 (5): 1005-21.

[19] Vroonen L, Daly AF, Beckers A. Epidemiology and Management Challenges in Prolactinomas. Neuroendocrinology. 2019; 109 (1): 20-7.

[20] Diop AG, Ndiaye MM, Ndiaye IP, Gueye M, Mauferon JB, Kabre A. [Prolactin adenomas in Dakar]. Dakar Med. 1990; 35 (2): 168-76.

[21] Deb S, Vyas DB, Pendharkar AV, Rezaii PG, Schoen MK, Desai K, et al. Socioeconomic Predictors of Pituitary Surgery. Cureus. 2019 Jan 25; 11 (1): e3957.

[22] Lee DK, Sung MS, Park SW. Factors Influencing Visual Field Recovery after Transsphenoidal Resection of a Pituitary Adenoma. Korean J Ophthalmol. 2018 Dec; 32 (6): 488-96.

[23] Mehta GU, Lonser RR. Management of hormone-secreting pituitary adenomas. Neuro Oncol. 2017 Jun 1; 19 (6): 762-73.

[24] Chanson P. Gonadotroph pituitary adenomas. Annales d'endocrinologie 2000; 61 (3): 258-68.

[25] Mete O, Cintosun A, Pressman I, Asa SL. Epidemiology and biomarker profile of pituitary adenohypophysial tumors. Mod Pathol. 2018 Jun; 31 (6): 900-9.

[26] Bayar I, Hasni Y, Ben Abdelkrim, Kacem M, Chaieb M, Maaroufi A et al. Non-functional immunonegative pituitary macroadenoma "null cell adenoma": about a case. 2017; 78 (4): 314.