

Review of Neurosurgical Scientific Productions at the Medicine Faculty of Parakou University and Impact on the Community from 2009 to 2021 in Benin Republic

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Abstract

Introduction: Scientific publication is one of the missions of both medical and educational faculties and their influence as well as their notoriety depend on their scientific production. **Objectives:** review of neurosurgical scientific productions at FM/UP and assess the impact of neurosurgery practice on the local community. **Methods:** Cross-sectional and descriptive study carried out from 2009 to 2021. It concerned the bibliometric analysis of publications and the local community's perception of neurosurgery. All indexed peer reviewed publications and scientific work where at least the two authors affiliated to medicine faculty of Parakou university were selected. **Results:** Eighty-three (83) scientific productions were included in this study. Among them, there were fifty journals articles and 33 doctoral thesis. Among the articles, twenty eight (56%) scientific publications are made in international journals with impact factor in 17 cases. Nineteen are published in neurosurgical international journals. Brain pathologies were the most treated with a proportion of 75.90% (63) of cases. Surveyed population aged from 15 to 65 years and the most represented are aged between 31 to 40 years old with a proportion of 37.11% of cases. The population were male in 61.86% of cases with a sex ratio of 1,62. Respondents had a higher level in 90.72% of cases. The population had already heard about neurosurgery practice in 69.07% of cases. The neurosurgical prac-

tice perception is good in 84.54% and they accept commonly a neurosurgical procedure in case of disease or pathologies to cure the patient in 78.23% of cases. **Conclusion:** Neurosurgical scientific production at medicine Faculty of Parakou University has been intense and varied over the past ten years. Their real impact is palpable on the community and facilitate the understanding of neurosurgery practice. Awareness and communication have positive impact of taking care of neurosurgical pathologies.

Keywords

Publication, Scientific Production, Neurosurgery, Impact, Community

1. Introduction

Scientific publication is one of the missions of medical faculties and their influence and reputation depend as much on the quality of their teaching as on their scientific production.

Nowadays, it is clear that medical research and scientific production have a positive impact on medical education and training, scientific innovation and the health of the general population [1]. Among medical specialties, neurosurgery is a young and fast-growing surgical discipline in sub-Saharan Africa. Neurosurgical practice has made major scientific contributions worldwide, as evidenced by the quantity and quality of publications [2] [3]. Classically, developed countries (USA, Western Europe, Russia, Japan) have been the leaders in neurosurgical research [4] [5]. Despite representing 12.5% of the world's population, Africa continues to generate less than 1% of global scientific research [6].

Since the 2000s, Africa's contribution to neurosurgical research has begun to be recognised by the rest of the world, particularly in certain countries in the north and south of the continent [1] [6] [7]. Very few studies in the literature have focused on evaluating neurosurgical scientific output in sub-Saharan Africa. As part of our efforts to promote this speciality in our academic environment, we decided to conduct this study to assess the impact, community perception and evolution of neurosurgeons' care for patients with neurosurgical pathologies in our immediate environment, after two decades of contributing to the training of doctors at the University of Parakou. This is not a simple census of neurosurgical scientific output, but a rigorous and scientific evaluation of neurosurgical publications in scientific journals and neurosurgical practice [7]-[9].

It should be noted that the city of Parakou has had a university with a medical school and a university hospital since 2001, and currently has two neurosurgeons who teach at the medical school and practice at the Borgou-Alibori University and Departmental Hospital Centre (CHUD-B/A).

2. Method and Study Materials

Our study was conducted at the Faculty of Medicine of the University of Parakou

and in the city of Parakou.

2.1. The University of Parakou

The University of Parakou is the second university in Benin. It was created in 2001 by Decree No. 2001-091/MESRS/DC/SG/SP of 19 October 2001, which defined its organisation and functioning with administrative and financial autonomy. The Parakou Faculty of Medicine aims to train doctors. Courses are taught from the first to the fifth year. These courses are combined with internships starting in the second year. Hospital internships are carried out at the CHUD-B/A. The neurosurgery teaching unit at the Faculty of Medicine of the University of Parakou consists of two (2) teachers, university hospital practitioners at the CHUD-B/A (Professor FATIGBA Olatoundji Holden and Dr QUENUM Kisito Kouassi Jean Marie Maurin (Associate Professor of Neurosurgery).

2.2. The City of Parakou

Parakou is one of Benin's municipalities with special status, in accordance with Law No. 98-005 of 15 January 1999 on the organisation of municipalities in the Republic of Benin. The municipality of Parakou is located 450 km north of Cotonou, the economic capital of Benin. It covers an area of 441 km² with a density of 577 inhabitants per km² in 2013. Its population was estimated at 254,254 inhabitants in 2013.

2.3. Type and Period of Study

This was a cross-sectional, descriptive study conducted from March to June 2021, covering the period from 2009 to 2021.

2.4. Inclusion Criteria

- ✓ Doctoral thesis in medicine dealing with neurosurgical pathologies defended at the FM/UP from January 2009 to January 2021 (exhaustive census).
- ✓ Articles dealing with neurosurgical pathologies published in national, regional and international general journals from January 2009 to January 2021.

To assess the impact of these publications on the community, a random survey of key informants was conducted. These included: FM/UP teaching staff, health workers, officials from the Borgou Departmental Health Directorate (DDS), caregivers of patients hospitalised in the neurosurgery unit of the CHUD/B, patients (whether operated on or not) seen in neurosurgery consultations at the CHUD/B, and individuals surveyed at random in the city of Parakou.

2.5. Exclusion Criteria

The following were excluded from the study:

- ✓ All theses and articles not dealing with neurosurgical pathologies and neurosurgical articles published before January 2009 or after January 2021;
- ✓ All neurosurgical theses and articles published outside the FM/UP by the au-

thors;

- ✓ Neurosurgical scientific activities in the form of scientific conference reports (scientific communications) and books;
- ✓ Individuals who objected to participating in the survey.

2.6. Studied Variables

Variables relating to scientific activities:

- Type of scientific output: articles and theses;
- Year of publication;
- Journals/newspapers of publication.

2.6.1. Characteristics of Journals

- ✓ indexed or not, local, regional or international, their impact factor;
- ✓ Publication topics;
- ✓ The spinal or cranioencephalic nature of the neurosurgical pathology treated;
- ✓ Ranking of neurosurgery teachers and students at FM/UP in articles.

2.6.2. Variables Relating to Socio-Demographic Characteristics

- ✓ Age (in years);
- ✓ Gender (male or female);
- ✓ Level of education;
- ✓ Occupation.

2.6.3. Variables Relating to Information about Neurosurgery

- ✓ Knowledge about neurosurgery;
- ✓ Conditions frequently treated by neurosurgery;
- ✓ Probable causes of conditions treated by neurosurgery;
- ✓ When to consult a neurosurgeon.

2.6.4. Variables Relating to Perceptions of Neurosurgery

Perceptions of neurosurgical procedures.

2.6.5. Variables Relating to the Impact of Neurosurgery on the Community

- Presence of a hospital and medical imaging facilities in the population's town;
- Presence of neurosurgical services and equipment.

2.7. Ethical Considerations

Approval from the Ethics Committee of health Faculty was obtained. All participants gave verbal consent. Anonymity and confidentiality of responses were guaranteed.

3. Results

3.1. Type of Scientific Output

Eighty-three (83) neurosurgical scientific outputs were included in the study, comprising 50 published scientific articles (60.24%) and 33 (39.76%) doctoral the-

sis in general medicine.

3.2. Year of Publication

The frequency and percentage distribution of scientific publications by year of publication is shown in **Figure 1**.

The years 2011, 2013 and 2020 were the years with the most significant scientific output at UP.

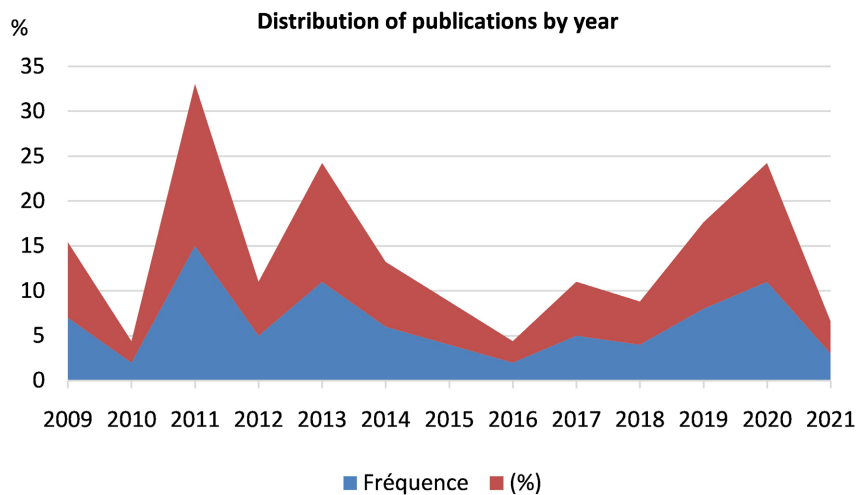


Figure 1. Distribution of publications by year.

3.3. Journals of Publication

The distribution in frequency and percentage of scientific works according to the journals of publication of the articles is shown in **Table 1**. The Open Journal of Modern Neurosurgery, La Revue du Cames Série A Science et médecine, L'ANNALES DE UP, and Cahiers du CBRST each accounted for 10% of the publications.

Table 1. Frequency and percentage distribution of scientific papers according to the journals in which they were published (n = 50).

	Fréquence	(%)
Revue du CAMES Série A Science et médecine	6	12
Open journal of modern neurosurgery	5	10
Annales de l'Université de Parakou	5	10
Cahier du CBRST	5	10
JNRT	4	8
Dakar médicale	2	4
Iranian journal of neurosurgery	2	4
JNIT	2	4
Mali médicale	2	4

Continued

World neurosurgery	2	4
Case reports in neurological medicine	2	4
The internet journal of neurosurgery	2	4
Case reports in clinical medicine	2	4
ISRN surgery	1	2
JAMO	1	2
Journal Afrique chirurgie digestive	1	2
Journal Afrique imagerie médicale	1	2
Journal de neurochirurgie	1	2
Neurochirurgie	1	2
Journal of neuroscience in rural practice	1	2
Guinée médicale	1	2
Tunisie médicale	1	2
	50	100

*JNRT: Journal of Neurological Research and Therapy; **JNIT: Journal of Neurosurgery Imaging and Techniques; ***ISRN surgery: International Scholar Research Notes surgery; ****JAMO: Journal Africain de Morphologie.

3.3.1. Journals Characteristics

The frequency and percentage distribution of scientific publications according to journal characteristics is shown in **Table 2**.

Articles were published in local and regional journals in 44% of cases, compared with 56% (28 publications) in international journals, 67.86% of which were indexed journals.

Table 2. Frequency and percentage distribution of scientific output according to the characteristics of international journals (n = 28).

	Frequence	(%)
Indexed journal		
Yes	19	67.86
No	9	32.14
Impact factor		
Yes	17	60.71
No	11	39.29
Type of journal		
Local and regional	22	44.00
International	28	56.00
Editorial theme		
Neurosurgical speciality	19	67.86
Others	9	32.14

3.3.2. Publication Topics

The frequency and percentage distribution of scientific works according to publication topics is as follows: topics related to cranio-cerebral pathologies predominate, with 63 (75.90%) of all scientific publications, followed by spinal pathologies with 20 (24.10%).

1) Spinal disorders

The distribution in frequency and percentage of scientific studies according to spinal disorders is shown in **Table 3**.

Among spinal disorders, degenerative disorders ranked first, accounting for 45% of studies.

Table 3. Distribution in frequency and percentage of scientific studies according to spinal disorders.

	Frequence	(%)
Degenerative pathology	9	45
Malformative pathology	6	30
Traumatic pathology	3	15
Tumoral pathology	1	5
Infectious pathology	1	5

2) Cranio-cerebral pathologies

The distribution in frequency and percentage of scientific works according to cranio-cerebral pathologies is shown in **Figure 2**.

Publications on traumatic pathologies predominated with 45 (71.43%), ahead of malformative pathologies with 12 (19.05%).

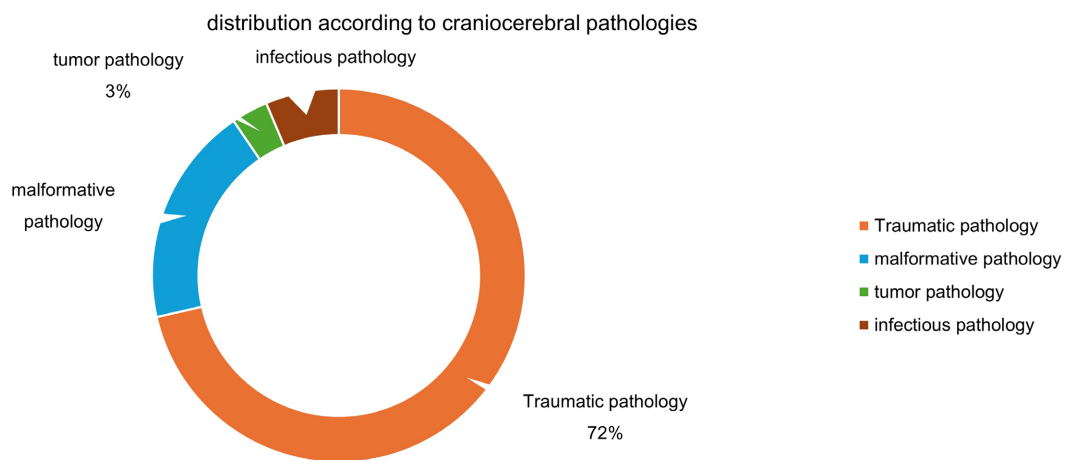


Figure 2. Distribution of scientific papers according to cranio-cerebral pathologies.

3.3.3. Ranking of Neurosurgeon Teachers and Students at FM/UP in Articles

Senior author FATIGBA O.H. was mentioned in 37 (74%) articles. He was the first author in 26 (52%) articles out of the 37 publications. The second senior au-

thor, QUENUM K., was mentioned in 13 (26%) articles, for which he was the first author in 53.85% (7 articles out of 13). Medical Students ranked between 3rd and 6th among the authors of the published articles.

3.4. Type of Study

It was noted that all neurosurgical scientific publications were descriptive clinical studies, of which 16 (19.28%) were case report studies.

3.5. Language of Publication

It was noted that 29 articles (58%) were published in French and the remaining 21 (42%) in English. All thesis were written in French. Noticed that the official language of the country is French.

3.6. Sociodemographic Characteristics of the Surveyed Population

The results of this study were based on 930 respondents.

3.6.1. Age

The distribution of the population by age group, in terms of numbers and percentages, is shown in **Figure 3**.

The age of the surveyed population ranged from 15 to 65 years. A predominance of young people was noted, accounting for 37.11% of cases.

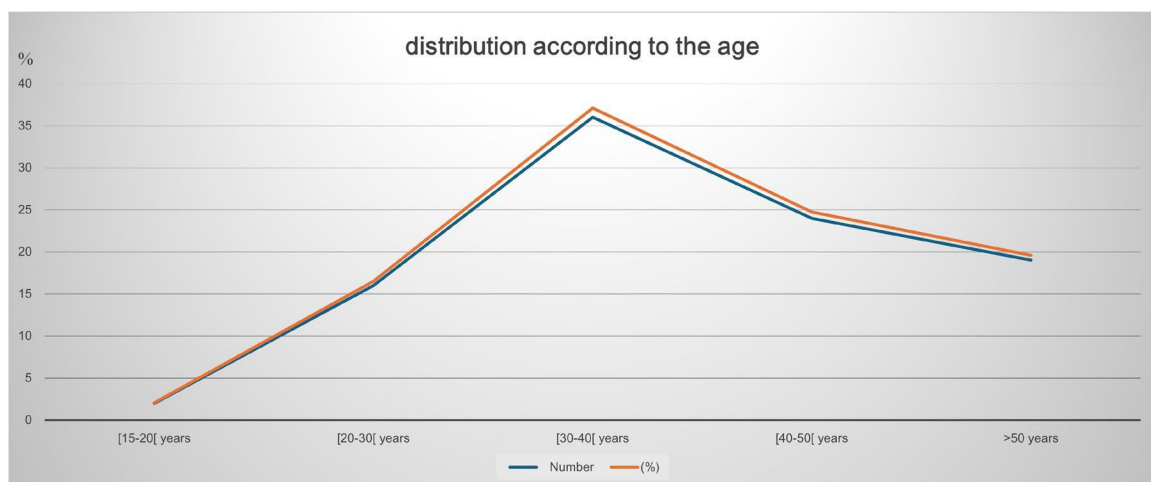


Figure 3. Distribution of the surveyed population by age group.

3.6.2. Gender and Level of Education

Males accounted for 61.86% (60 men) and females accounted for 38.14% (37 women). The sex ratio (60/37) was 1.62. The level of education was high, with 88 (90.72%) having attended school and nine (9.28%) of those surveyed having no schooling. Among those who had attended school, 50 (51.55%) had a higher education.

3.6.3. Occupation

In terms of occupation, 16.13% were public sector employees, 52.69% were private

sector employees and 31.18% were healthcare workers.

3.7. Knowledge of Neurosurgery

The population had already heard of neurosurgery in 69.07% (67) of cases. Their source of information was theoretical teaching in 28.36% (19) of cases. The other respondents had been involved in the care of a patient suffering from a neurosurgical condition and were therefore aware of the role of this specialty in healthcare in Parakou in 66.67% (40) of cases and at the national level in 64.52% (60) of cases. The exact number of neurosurgeons practising in Parakou is 2 and well-known to all surveyed.

3.7.1. Conditions Frequently Treated by Neurosurgery

Depending on the population, surgical lesions of the brain (58.76% (57)) and skull (55.67% (54)) are the conditions most frequently treated by neurosurgery. Surgical lesions of the spine (38.14% (37)) and spinal cord (43.30% (42)) are rarely treated by neurosurgery, according to respondents. The management of pathologies is multifactorial, according to 41.24% (40) of the population.

3.7.2. When Should a Neurosurgery Consultation be Sought?

The distribution in numbers and percentages of the population according to the reasons for seeking a neurosurgery consultation is shown in **Figure 4**.

Among the reasons for seeking a neurosurgery consultation, the predominance of head injuries was noted in 64 respondents (65.98%).

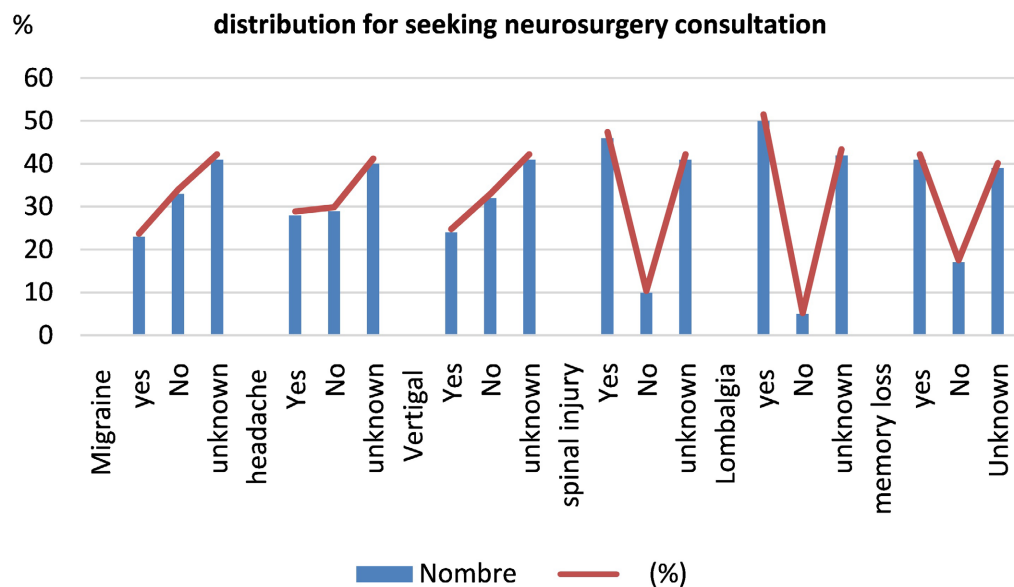


Figure 4. Percentage distribution of the population according to the reasons for neurosurgical consultation.

The following **Figure 5** shows the distribution according to the grouping of spinal and cranioencephalic pathologies.

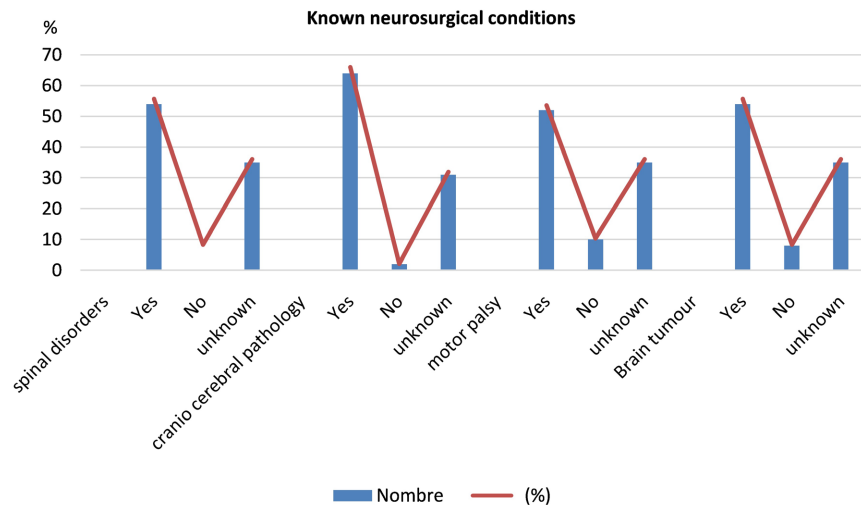


Figure 5. Percentage distribution of the population according to neurosurgical conditions

3.7.3. Perceptions of Neurosurgery

The population would accept neurosurgery in the event of illness in 55.67% (54) of cases. In the event of a loved one undergoing surgery, 45.36% (44) would fear death, but 84.54% (82) believe that patients’ clinical condition would improve after neurosurgery.

The distribution in terms of numbers and percentages of the population according to their perception of neurosurgical procedures is shown in **Table 4**.

The population has a good understanding of neurosurgical procedures (50.51% (49)) and believes that they save lives in 78.23% (72) of cases.

Table 4. Distribution of the population by number and percentage according to their perception of neurosurgical procedures

	Frequence	(%)
What concerns do you have about neurosurgery procedures?		
Good	49	50.51
Average	32	32.90
Poor	16	16.49
Do they save lives?		
Yes	72	78.23
No	4	4.12
Unknown	21	2.65

3.8. Impact of Neurosurgery on the Community

3.8.1. Presence of Hospitals and Medical Imaging Facilities in the Subjects’ Town

All respondents are aware that there is a hospital in their town (100%) (93) with a radiology department equipped for neurosurgery in 78.49% (73) of cases.

Availability of neurosurgical services and equipment

According to 83 (89.25%) of those surveyed, there is a neurosurgery unit in hospitals. The existence of a neurosurgical intensive care unit, an equipped neurosurgical operating theatre and a physical medicine centre remains unknown to 5.16% (21), 58.06% (54) and 29.03% (27) of the population surveyed, respectively.

Figure 6 shows the distribution in numbers and percentages of the population according to the presence of neurosurgical services and equipment.

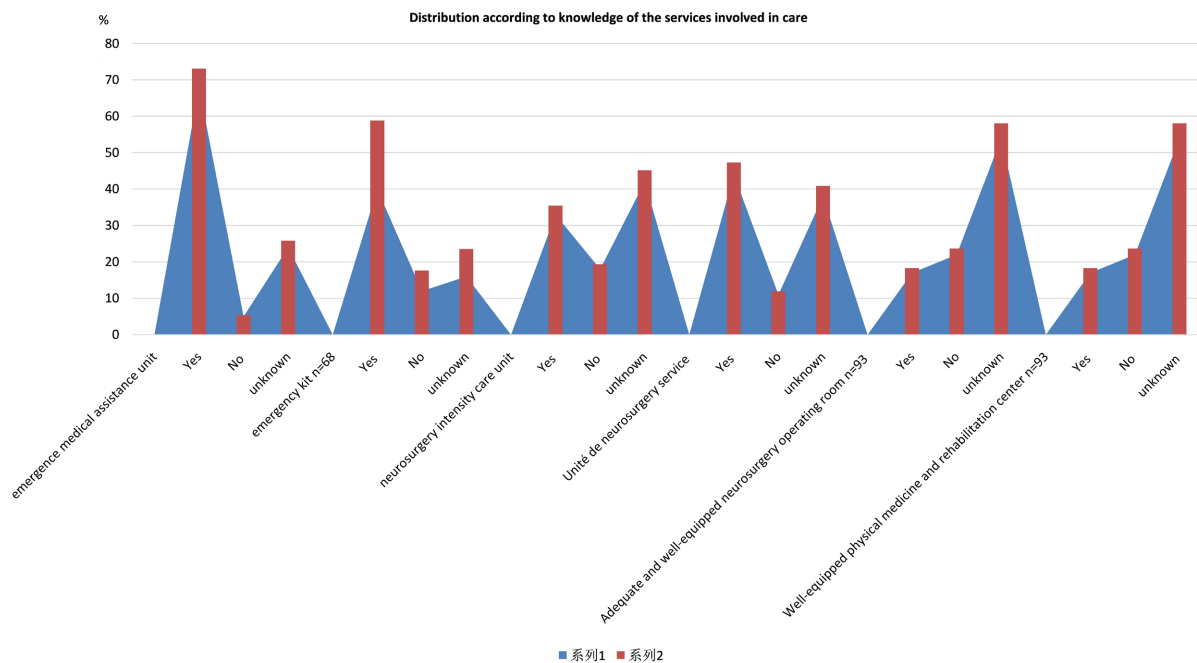


Figure 6. Distribution according to knowledge of the services involved in care.

3.8.2. Probable Risk Factors for Neurosurgical Conditions

The distribution in terms of numbers and percentages of the population according to probable risk factors for conditions treated in neurosurgery is shown in **Figure 7**.

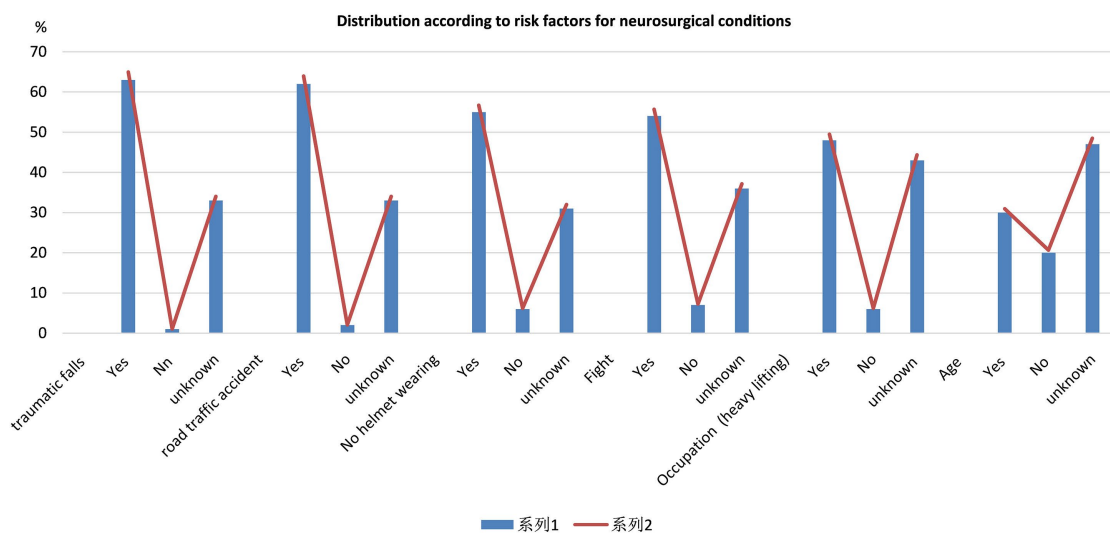


Figure 7. Distribution according to risk factors for neurosurgical conditions.

Traumatic falls (63, or 64.95%) and road traffic accidents (62, or 63.92%) were the probable causes of pathologies treated in neurosurgery according to the population. The distribution in number and percentage of the population according to probable risk factors for pathologies treated in neurosurgery is shown in **Figure 7**.

4. Discussion

Our study reports on all scientific publications produced at the University of Parakou in the field of neurosurgery from 2009 to 2021. It compiled 83 neurosurgical scientific productions over a period of 12 years, an average of 6.91 per year, with extremes ranging from 2 to 15. In Pakistan, Muhammad Shahzad Chamim *et al.* [10] found 62 scientific publications on neurosurgery over a period of five years, an average of 10.3 per year, with extremes ranging from 8 to 13. This higher productivity can be explained by the greater number of neurosurgeons in Pakistan (150 neurosurgeons according to Muhammad Waqas *et al.* [10] [11] compared to 02 neurosurgeons at parakou region in Benin Republic.

4.1. Year of Publication

In our study, 2011, 2013 and 2020 were the years with the highest scientific output at the UP, reflecting a fluctuating trend in neurosurgical scientific output over the last twelve years, unlike in Pakistan, where the trend was relatively constant [11], which could be explained by the insufficient number of neurosurgeons and the increased production of theses/articles during certain years. These years corresponded to periods of grade changes for the two university lecturers. The same is found at ivory coast [7] which have the same area as parakou, because it is west africa country.

4.2. Characteristics of Journals

In our study, the majority of articles were published in international journals (56.0%) compared to 44.0% in local and regional journals. A preference for indexed journals was also noted in 67.86% of cases, and for journals with an impact factor in 60.71% of cases. This trend is comparable to Pakistani authors [11] and moroccan neurosurgery history [6], where 77.4% of articles were published in local indexed journals and 22.6% in international journals over a five-year period.

4.3. Publication Topics

In our study, traumatic pathologies accounted for 48 (57.83%) of the publication topics, which is significantly higher than the results of authors from developed countries [12]-[14], where the proportions were around 8% and 25.8% for neurosurgical trauma topics in their study. This finding can be explained by the importance of traumatic pathologies in neurosurgical practice in Parakou and the lack of civic-mindedness among the population with regard to compliance with traffic regulations (wearing helmets, wearing seat belts when driving motor vehicles).

4.4. Ranking of Neurosurgery Teachers and Students at FM/UP in Articles

Medical Students were never the first author in published articles but ranked between 3rd and 6th, which differs from some authors [15] [16], who found an average of 16.27 first-author publications by medical students. This could be explained by a lack of desire, ideas and initiative for scientific research in the field of neurosurgery, as well as an insufficient number of supervisors.

4.5. Type of Study

It was noted that all neurosurgical scientific publications were descriptive clinical studies, including 16 (19.28%) case report studies, which differs from some authors findings of, who found 39% case report studies and 61% technical studies [17]-[19]. This finding can be explained by the smaller number of faculty members in the neurosurgery department at FM/UP, the lack of funding for scientific research, and the lack of training on different types of scientific research [20].

4.6. Knowledge of Neurosurgery

In our study, 69.07% (54.8% in Morocco [6] of the population surveyed were aware of neurosurgery. 61.86% (69.4% in Morocco) of the population studied confirmed the existence of neurosurgery in Benin, with 66.67% believing that neurosurgery was more prevalent in Parakou, and 44.33% (51.3% in Morocco) estimating the number of neurosurgeons in Benin to be more than 12 specialists. Traumatic brain injury (TBI) was the most common pathological condition requiring neurosurgical consultation according to the study population.

It was reported by 65.98% (75.2% in Morocco [1] [5] of the population surveyed, followed by brain tumours with a percentage of 55.67% (89.4% in Morocco) and sensory-motor deficits with a percentage of 53.61%. 45.36% of the population studied believed that death is a risk of neurosurgical surgery, followed by disability with a percentage of 29.90% of the subjects questioned believed that there could be an improvement in the patient's health after neurosurgery, and 55.67% agreed to undergo surgery for a neurosurgical condition in Benin if necessary comparing to ivoiry cost study [7]. Our results are consistent with those obtained in a similar survey conducted in india [20].

It is worth noting the prevalence of TCE in Benin and brain tumours as the leading reason for neurosurgical consultation in Morocco, as well as the fear of disability as the primary risk of neurosurgery according to Moroccans, as opposed to death in Benin. This situation could be explained by the high number of motorcyclists and motorcycle taxis, non-compliance with traffic regulations, and the socio-cultural context in Benin.

4.7. Impact of Neurosurgical Scientific Output on the Community

Our results show that 95.88% of the population studied recognise the existence of at least one hospital in the major cities of Benin, but the majority (54.64%) are

unaware of the existence of a neurosurgery unit in these hospitals. The existence of an adequate and well-equipped neurosurgery operating theatre and a physiotherapy centre is also unknown to 58.06% of the population surveyed. The same observation was made regarding the periodic organisation of continuing education in neurosurgery among 75.27% of the population studied. 48.39% do not know the number of neurosurgeons practising in hospitals and 26.88% estimate this number to be 2. Traumatic falls are the leading cause of neurosurgical conditions, accounting for 64.95% of cases, followed by road accidents (63.92%) and not wearing a helmet (56.70%), according to the population studied. The rules for picking up a person with a head or spinal injury remain unknown to 78% of the population, but 70.10% believe that an accident victim should be carried in a straight, upright position [21].

These results could be explained by the lack of media coverage at national or even international level of the conclusions and suggestions of neurosurgical scientific research produced at the UP.

4.8. Limitations and Difficulties of the Study

Among the weaknesses of this study is the fact that the h-index was not included. This is a complex, individual calculation, with variables depending on the calculation method (Google Scholar, Scopus), academic rank and career progression. Biases in the h-index have already been reported by other teams, in particular the bias of self-citation [10] [22] [23].

5. Conclusion

This study shows that scientific output in neurosurgery at FM/UP has been intense and varied over the last ten years. Its real impact on the community is palpable. The scientific and material contribution to the care of patients with neurosurgical conditions is recognised and greatly appreciated by the survey respondents and, by extension, by the community in general. More specialised awareness-raising and communication remain a tool for popularising neurosurgical activities.

Conflicts of Interest

There are no conflicts of interest.

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