

Gender and graduating results in the Anesthesiology and Intensive Care Abomey-Calavi (Cotonou, Benin) program

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Abstract

Background: For unknown reasons female participation in anesthesiology is very low in Sub-Saharan Africa (SSA), especially in West Africa, and few women reach top academic or clinical positions.

Objective: Women reduced professional perspectives.

Design: Male and female residents' performances were compared when they presented for their first try the graduating exams of the specialty.

Settings: The Cotonou anesthesiology and intensive care training center, the second largest in French-speaking SSA, where 146 anesthesiologists from 14 African countries graduated since its creation in 1996.

Method: All results at their final exams (consisting in 3 written questions and 2 clinical evaluations) were retrieved for the 125 men and 21 women who graduated. Scores obtained by women and males were compared using Student's t tests. Their total of points was used to divide graduates into deciles. The proportion of women was counted in each decile.

Results: Women performed better at both anesthesia and intensive care clinical evaluations taken separately and together (total 68.2% vs. 64.2% $p=0.004$) and were even with men for the three written exams (anesthesia, intensive care and basic sciences - total 66.2% vs. 66.1% $p=0.99$). When clinical and written scores are added in each sector, women scored better than males for anesthesiology (69.2% vs. 65.2% $p=0.01$) and were even for intensive care (65.0% vs. 64.1% $p=0.51$). Globally women and men results were similar (67% vs. 65%, $p=0.1$). The proportion of women in each decile increased from the lowest to the best deciles, but the absolute low number of women gives this trend borderline significance (slope +1,56% women per decile, $p=0.046$ **).

Conclusion: Women performance at end-specialty exams is unlikely to explain their subsequent underrepresentation at the academic level in anesthesia and intensive care in SSA**.

Keywords: Anesthesiology; Gender; Certification Exam; Africa (Sub-Saharan); Medical Education.

Introduction

In Sub-Saharan Africa (SSA) the Women Anesthesia Specialist in Africa study group (WASA) found that the proportion of females in anesthesiology

lags behind that in medicine, but that this difference is essentially due to a total lack of feminization of anesthesiology in West Africa¹. This situation does not help the urgent need to increase anesthesia workforce to meet the 2030 Global Surgery

Previous presentations or publications: a preliminary analysis of our data has been presented at the last World Congress of Anesthesia: Ki B, Zoumenou E Chobli M, lePolain de Waroux B, Baele PL. Gender and graduating anaesthesiology results in the Abomey-Calavi university programme. Abstract Book, 17th World Congress of Anaesthesiologists, September 1-5, 2021; Anesthesia & Analgesia 133(3S): 526 – 527, September 2021. <https://journals.lww.com/anesthesia-analgesia/toc/2021/09002>

objectives, as set in 2015 by the World Health Assembly of WHO nations in its 60/15 resolution^{2,4}.

In both East and West Africa the already low proportion of female anesthesiologists at higher academic levels (full professor and associate professor) is still decreasing, a trend that will inevitably decrease feminine role models⁵, further reducing attractiveness of that specialty for young female physicians. The reasons for lack of academic progression of women anesthesiologists in SSA are unclear.

In 11 SSA countries, WASA also found that at the end of medical studies women perform better than men⁶. Lower academic performances during specialty training could still be hypothesized. To clarify such concern this study compared how women and men performed at final specialty exams during 20 years in the Abomey-Calavi Anesthesiology and Intensive Care program located in Cotonou, republic of Benin (referred to below as “Cotonou”)⁷.

Settings and Methodology

The Cotonou program enrolled its first candidates in 1996. Between January 2000 and December 2019 148 anesthesiologists graduated, from 16 French-speaking African countries. Since its inception the Cotonou diploma followed the official requirements of the CAMES (Conseil Africain et Malgache pour l'Enseignement Supérieur)⁸. The present study analyzed all points obtained by those candidates when they took their graduating specialty exams. Only the first try was considered if a candidate failed and had to retake the exams. Points obtained during subsequent attempts were not taken into consideration.

Candidates are selected by an entrance exam. During their first and second years, residents are tested on the theoretical courses they receive. These In-Training Exams (ITE) had indicative value but rarely resulted in the obligation to repeat a year of training.

Theoretically, at Cotonou a full anesthesiology training takes four years, but many residents prolong their training before taking their finals for the first time. Various reasons may justify such delay: health conditions, pregnancies, but more often residents prolong a paid rotation in a technologically advanced country. Indeed, residents are encouraged to spend their third year in Europe, where many tend to stay longer than foreseen, the additional years amounting to an often-ignored form of brain-drain.

The observation period stopped in 2020 because the Covid-19 epidemic somewhat changed the

format of the final exams, which had remained unchanged until December 2019.

Final exams are grouped in a one-week session including three written exams and two clinical evaluations. The written exams concern Anesthesiology, Intensive Care and Basic Sciences. At least one of the written questions is prepared by a foreign professor. The clinical tests evaluate first a candidate's performance while providing an anesthetic in the operating room and taking care of the patient in the recovery room, and second his/her clinical approach at the bedside of a patient recently admitted in an Intensive Care Unit and how he/she defends orally his/her differential diagnosis and proposed treatment in front of the jury.

Written exams are written on special anonymized paper sheets. All candidates sitting the same exam session receive the same questions. All corrections are made according to a pre-set weighted grid. Points are then written in ink on the copies, and the still anonymous sheets are forwarded to the president of the jury under sealed envelope. The points of written copies are formally recorded before anonymity is broken during final deliberation of the jury.

For clinical tests, if there were many candidates, half of the jury observed and interrogated half of the candidates for one test and the other half for the other test. Points given by the jury members for each clinical test of a given candidate are simply averaged.

Each written exam is rated on a maximum of 40 points, for a total of 120 points for theory. Each clinical test is evaluated on a maximum of 60, for a total of 120 clinical points. To pass and get the diploma and title of Specialist in Anesthesiology and Intensive Care, a candidate must get at least 144 (60%) of the grand total of 240 points, at least 60 (50%) of the 120 clinical evaluations points and 60 (50%) of the 120 written exams points, and never less than 40 % on any single written or clinical test. Failure results in the obligation to prolong training and sit for another session.

For each session, a comprehensive report of points and jury decisions detailing each candidate is written and signed by all members of the jury and sent to the Faculty of Medicine, a copy being kept at the department archives. Those documents were retrieved and analyzed for the present study.

Juries included at least two Beninese and two non-Beninese professors, one African and one European. Jury composition has been very stable over the studied period. Only once did a female professor (from Africa) participate in a jury; all other jury members were male.

Student's t test was used to compare the mean scores obtained by men and women for each examination part taken separately, for the total of clinical scores, for the total of written copies, for the total of anesthesia exams (written + clinical), for the total of intensive care exams (written and clinical) and for the general total (all written and clinical parts).

The average number of residency years spent before graduation by men and women was compared in the same way.

All candidates were pooled together, then ranked according to their global scores and divided in deciles with ex-aequos left in the same decile.

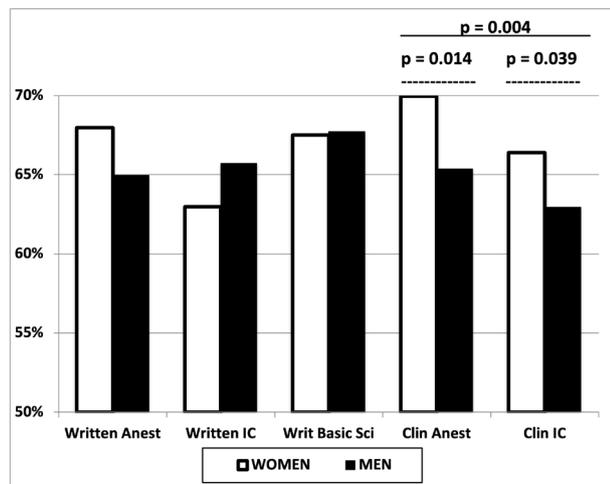


Fig. 1 — Gender Cotonou Histogram.

The proportion of women was determined for each decile and a general trend determined between deciles.

The evolution over time of global exam results has been analyzed in the same way.

Results

Among the 148 candidates who graduated from Cotonou between 1999 and 2019, 22 were women (14,9%) and 126 men. Comprehensive data could be retrieved for all candidates.

Two candidates (one female and one male) were extreme outliers, having failed 4 and 5 exams and getting global scores of 42,39 % and 42,44 %, respectively. Only these candidates needed to take their finals three times to graduate. They were excluded from the data base to allow for robust statistical analyses, leaving 146 candidates, 21 women and 125 men.

All results, expressed as percentages of maximum scores are detailed in Table 1 and Fig 1. Results expressed as points are presented in this paragraph. Women obtained better scores for the clinical evaluations, 81.8 ± 6.7 points vs. 79 ± 8.6 , on a maximum of 120 (mean difference = 4.8 ± 2 ; 95% CI +1.0 to +8.7 points, t test: $t=2.91$, $p=0.004$). The same was true for each clinical evaluation taken separately: Anesthesia 42 vs. 39.2 points ($p=0.01$) and Intensive Care 39.8 vs. 37.8 points

Table 1. — Comparison between men's and women's graduation exams results at the Cotonou Anesthesia and Intensive Care Physician Specialists training center between 2000 and 2019. There were 21 women and 125 men. As different exams and evaluations are noted on different maxima, all points are presented as percentage of the maximum points for each exam or total of selected exams. The last lines indicate the statistical significance of differences between men and women results in each column. Written = written questions; Clinical = clinical evaluations at the bedside (for Intensive Care) or in the Operating Room and Recovery Room (for Anesthesia); Anesth = anesthesia; Intensive = Intensive Care; Basic Sc = Basic Sciences; Total Anesth = Written + Clinical anesthesia exams; Total Intensive = Written + Clinical Intensive Care exams; Grand Total includes all exams taken for graduation.

All values are %		Written			Clinical		Total	Total	Total	Total	GRAND
Anesth		Intensive	Basic Sc	Anesth	Intensive		Written	Clinical	Anesth	Intensive	TOTAL
21 WOMEN	Mean	67.98	62.98	67.51	69.96	66.39	66.15	68.18	69.17	65.02	67.16
	Median	70.00	63.75	70.00	72.08	67.50	65.33	66.88	67.50	65.75	67.81
	Min	45.00	40.00	50.00	49.00	55.00	54.17	57.25	59.40	49.00	55.83
	Max	85.00	80.00	87.50	85.00	77.50	78.33	76.67	82.00	74.00	75.42
	STD	9.93	11.43	9.73	7.55	6.65	7.38	5.61	6.06	5.99	5.11
125 MEN	Mean	64.95	65.71	67.73	65.36	62.95	66.13	64.15	65.19	64.05	65.14
	Median	65.85	65.00	68.13	67.50	63.33	66.25	65.00	65.50	64.50	65.42
	Min	30.00	27.50	25.00	35.00	25.00	38.33	42.50	41.00	36.00	48.13
	Max	81.00	95.00	92.50	82.50	82.50	80.00	80.00	80.00	81.00	78.13
	STD	9.97	10.60	10.70	9.53	8.85	7.15	7.17	7.14	7.64	5.71
Women	Student t	1.29	-1.02	-0.10	2.48	2.08	0.01	2.91	2.71	0.66	1.65
vs. Men	p value	0.20	0.31	0.92	0.014	0.039	0.99	0.004	0.008	0.51	0.10

($p=0.04$). There were no significant differences for written exams. Women scored better than men when written anesthesia points were added to clinical anesthesia evaluations ($p=0.008$), but not for Intensive Care totals. No other statistically significant differences were found, in particular between grand totals of all scores ($p=0.1$).

Looking at the grand totals, women had better rankings and the 5 superior deciles included larger proportions of women than the 5 lower deciles, with a slope of 1.6 % female increase per decile (CI +3% to +0.2 %, $p=0.046$) (Figure 2).

Women took an average of 5.0 years and men 5.13 years to graduate; the proportion finishing their full curriculum in 4 years was 28.6% for women and 26.6% for men; none of these differences being significant.

Global results tended to slightly decrease over the years, a statistically non-significant slope (minus 0.35 point per year, on maximal scores of 240).

Discussion

In this comprehensive series from one major program training physician anesthesiologists for French-speaking SSA countries⁷ women obtained globally equal scores to men and specifically did better at the clinical parts of graduating exams. They also outscored males in anesthesia, both written and clinically.

The influence of gender has been widely studied both at the level of basic medical studies and during specialty curricula. Several studies compared clinical-oriented vs. theoretical exams.

The first moment of interest is the end of medical studies and selection to enter a specialty. In 11 SSA

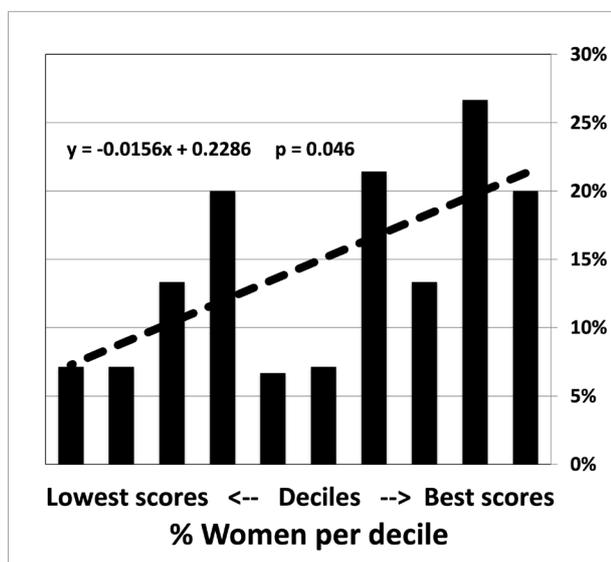


Fig. 2 — Gender Cotonou Deciles.

countries, the WASA group found that at the end of medical studies women perform better than men⁶. The Membership of the Royal College of Physicians (MRCP) is a three-stage high-level international postgraduate medical assessment for physicians postulating for a medical career in the UK. Women perform better than males on the assessment using real or simulated patient examination skills (called PACES) while males do better on the multiple-choice tests (MRCP parts 1 and 2)⁹⁻¹¹.

The next period of interest is residency, first during In-Training Exams (ITE), then at final exams. That women in Cotonou tend to score better at final clinical evaluations participates to a general tendency existing in high-income countries both in internal medicine¹² and anesthesiology^{13,14}. As ITE are written multiple-choice exams, they are fairly predictive of success at the written Part 1 American Board of Anesthesiology (ABA) accreditation exams. Men perform better at Part 1 exams, but women get even at the Part 2 two-jury structured oral and more clinical-oriented examination^{13,14}. It is generally agreed that success at clinical exams is more difficult to predict, because they also assess humanistic qualities such as communication skills and professionalism¹⁵⁻¹⁸. For example, in the field of surgery, almost no correlation has been found between end of rotation faculty evaluations of residents' medical knowledge and residents' American Board of Surgery ITE (written) performance¹⁹.

Anesthesiology is a clinical and highly technical profession. It requires good understanding of the scientific bases that support its practice, but also good human and professional qualities that are the essence of teamwork and essential for gaining patient confidence. Clinical evaluations at the end of anesthesiology training are therefore justified. The findings of our study plead to give more importance to clinical evaluations earlier during training. This could be done at formal end-year exams or spread throughout clinical rotations, provided a structured approach is respected for the evaluation and its ratings.

In SSA, the Anesthesia-Intensive Care specialty also covers Emergency Medicine practice. If better clinical evaluations obtained by women at final exams reflect the quality of later clinical practice, our findings might also concern the outcome of future emergency room patients; recent studies suggested that women physicians might perform better than their male counterparts^{20,21}, even if these papers have stirred some controversy²².

Beyond the influence of gender on end-residency evaluations the influence of the gender of examiners has also been studied previously. For

the certifying examination of the American Board of Internal Medicine, before 1987 men performed better than women. This had been associated to the gender of evaluators, male residents receiving better scores from male attending physicians²³. This situation was even thought to generate negative consequences beyond residency. Over time this gender gap closed and maintained at equity after 1996, and a recent single-institution study found no difference in global evaluation scores¹². The Cotonou juries were almost exclusively male. One might think that it induced a pro-female evaluation bias during clinical (non-blinded) assessments, although the reverse bias could also be suspected²⁴ and has been found to exist²³. However, such biases have not been documented in more recent studies of similar MRCP clinical assessments^{9,10}.

Despite women performing as well or even better at the residency level, large disparities persist at higher academic levels²⁵⁻²⁷.

Finally, on the average, women graduating in Cotonou did not need more time than males to get their diploma, notwithstanding that, as a group, they gave birth to several children... which males did not.

This study has several strengths: all data could be retrieved, juries had a stable core membership, worked along the same rules and rated candidates with the same methodology over the years, global scores were constant over time, since 2000 the Cotonou program has been the second largest French speaking SSA anesthesiology training center, graduated one-fourth of SSA French-speaking anesthesiologists, and provided specialists for more countries than any other one^{1,7}. Therefore, within the limits expressed hereafter, the conclusions of this study may probably apply to the whole of French-speaking SSA.

The main limitation of this study comes from the small absolute number of female candidates. Low female participation is a striking feature of anesthesiology in West Africa, and this is not limited to Cotonou¹. This was the main reason for launching the WASA studies, of which the present work is a logical outgrowth. WASA found that women made 21% of anesthesiologists trained in French-speaking SSA, 18% when only considering West-African countries. Practically, the small number of women in our study population prevents drawing firm conclusions other than saying that women are not academically inferior to males as far as anesthesiology in SSA is concerned.

Conclusion

So far as these comprehensive data from one major training center may represent SSA realities,

women's performance at anesthesiology end-specialty exams is unlikely to explain their subsequent underrepresentation at the academic level.

Conflicts of interest: None of the authors declares any conflict of interest.

Financing and financial interests: No funding has been received for this study.

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