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RESEARCH ARTICLE

# Women's breast cancer risk factors in Kinshasa, Democratic Republic of the Congo

**Stanislas Maseb'a Mwang Sulu**[1] **Olivier Mukuku**[2*] **Arnold Maseb Sul Sulu**[1] **François Musul Mukeng**[1] **Bienvenu Lebwaze Massamba**[1,3] **Désiré Kulimba Mashinda**[4] **Stanislas Okitotsho Wembonyama**[5] **Vicky Lokomba**[3] **Antoine Tshimpi Wola**[3]

[1] Nganda Hospital Center of Kinshasa, Kinshasa, Democratic Republic of the Congo
[2] Higher Institute of Medical Techniques, Lubumbashi, Democratic Republic of Congo
[3] Faculty of Medicine, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[4] School of Public Health, University of Kinshasa, Kinshasa, Democratic Republic of the Congo
[5] Faculty of Medicine, University of Lubumbashi, Lubumbashi, Democratic Republic of the Congo



*Correspondence to: Olivier Mukuku, Higher Institute of Medical Techniques, Lubumbashi, Democratic Republic of Congo; Email: oliviermukuku@outlook.fr

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**Abstract:** **Purpose**: Breast cancer (BC) is the most common malignancy and the leading cause of cancer-related deaths among women worldwide. Risk factors for this disease are numerous and their prevalence varies according to racial and ethnic groups and geographical regions. Therefore, we sought to identify BC risk factors in the Congolese population. **Methods**: A case-control study was conducted at the Nganda Hospital Center in Kinshasa, Democratic Republic of the Congo. One hundred and sixty patients with breast cancer (cases) were compared to 320 women who did not have BC (controls). STATA version 16 was used to analyze data with statistical significance considered at $p < 0.05$. **Results**: There is a strong association between BC in Congolese women and early menarche age (adjusted odds ratio [aOR] = 2.3; 95% CI: 1.2-4.3), family history of BC (aOR = 2.5; 95% CI: 1.2-5.5), overweight (aOR = 1.8; 95% CI: 1.1-2.7), and obesity (aOR = 7.3; 95% CI: 4.0-13.4). **Conclusion**: Our results indicate the presence of certain conventional risk factors. Thus, these results will be of great value in establishing adequate evidence-based awareness and preventive measures among the Congolese population.

**Keywords:** breast cancer, risk factors, Congolese women, Kinshasa

## 1 Introduction

Breast cancer (BC) is the most common cancer among women worldwide, in general [1], and in the Democratic Republic of the Congo (DRC), in particular [2, 3]. Numerous epidemiological studies over the past three decades have identified a number of risk factors associated with BC [4–6]. In addition to genetic and reproductive factors, the BC risk varies widely ethnically and geographically [7]. BC risk factors may vary from region to region of the world and environmental factors are more important than genetic factors [6, 8]. One study found that menstrual and reproductive factors are associated with an increased BC risk because they may increase lifetime exposure to estrogen [9]. BC is a multi-factor process. Some authors have focused on genetic predisposition and its association with modern lifestyle, including diet and alcohol consumption [8]. Oral contraceptive pills have also been shown to increase the BC risk, which decreases after discontinuation [10, 11].

In the DRC, with a huge variation in lifestyles, culture, geography, habits, and diets, to our knowledge, there are no publications on BC risk factors. Indeed, factors responsible for differences in the incidence of BC among women are not fully understood, which may be explained by reproductive and lifestyle factors such as diet, menarche, and menopausal age, age at first birth, obesity, abortion, and BC family history [6, 12–15].

Knowledge of risk factors for BC is very important in screening women at risk and in the use of BC screening and prevention programs. Since risk factors are unique to each community, we believe that studying BC risk factors among Congolese women is an important step in planning screening and prevention programs. This study attempts to identify some of different BC risk factors among Congolese women living in Kinshasa, in the DRC.

## 2 Materials and methods

This was a case-control study of 160 women (cases) aged 26 to 75 who had been diagnosed histologically with primary breast cancer between January 2014 and December 2019, taken care

of in the oncology department of the Nganda Hospital Center in Kinshasa (DRC). This center is recognized as a reference center for BC management in the DRC. During this study period, women with BC received a letter of introduction describing objectives of the study. Women who agreed to participate in the study were then interviewed personally by a qualified interviewer.

The control group consisted of 320 Congolese women with no BC history or neoplastic disease and were invited to participate in the study questionnaire. These volunteers were recruited into the study during the same calendar period as cases. The control women were recruited from the same city as cancer patients. The case-control ratio was 1:2. Cases and controls were matched individually with age ($\pm$ 2 years).

The questionnaire included information on age, current body mass index (BMI), physical exercise status, smoking, alcohol consumption, personal history of diabetes mellitus, family history of BC, and reproductive characteristics such as age at menarche, parity, breastfeeding, and use of oral contraceptives. In addition to the BMI (which was based on actual measures of weight and height), all other factors studied here were self-reported. Informed consent was obtained from study subjects prior to the interview.

Data entry and analysis were performed using Epi Info 7.2 and STATA version 16. Bivariate and multivariate analyzes were performed and adjusted odds ratios [aOR] (by logistic regression analysis) were calculated. The $p$-value of $<0.05$ was considered statistically significant.

# 3 Results

A total of 480 women (160 BC cases and 320 controls) participated in the study. Table 1 presents the distribution of demographic characteristics and potential risk factors studied between cases and controls separately. No statistically significant differences were observed in the age distribution of cases and controls (p=1,000). The mean age of cases and controls was 43.4 $\pm$ 11.6 years and 42.7 $\pm$ 10.9 years respectively (p = 0.525).

**Table 1** Age and potential risk factors for participants

| Variable | Cases (n=160) n (%) | Controls (n=320) n (%) | $p$-value |
|---|---|---|---|
| Age | | | 1.000 |
| $<$ 40 years | 28 (17.5) | 51 (15.9) | |
| 40-49 years | 56 (35.0) | 119 (37.2) | |
| 50-59 years | 44 (27.5) | 90 (28.1) | |
| $\geq$ 60 years | 32 (20.0) | 60 (18.8) | |
| Age at menarche | | | 0.022 |
| $<$ 12 years | 24 (15.0) | 25 (7.8) | |
| $\geq$ 12 years | 136 (85.0) | 295 (92.2) | |
| Parity | | | 0.716 |
| 0 | 19 (11.9) | 33 (10.3) | |
| $\geq$ 1 | 141 (88.1) | 287 (89.7) | |
| Breastfeeding | | | 0.336 |
| Yes | 138 (86.3) | 287 (89.7) | |
| No | 22 (13.8) | 33 (10.3) | |
| Oral contraceptive use | | | 0.505 |
| Yes | 150 (93.7) | 306 (95.6) | |
| No | 10 (6.3) | 14 (4.4) | |
| Alcohol consumption | | | 0.303 |
| Yes | 125 (78.1) | 264 (82.5) | |
| No | 35 (21.9) | 56 (17.5) | |
| Smoking | | | 1.000 |
| Yes | 5 (3.1) | 9 (2.8) | |
| No | 155 (96.9) | 311 (97.2) | |
| Body mass index (kg/m$^2$) | | | $<$ 0.001 |
| $<$ 25 | 63 (39.4) | 202 (63.1) | |
| 25-29.9 | 53 (33.1) | 98 (30.6) | |
| $\geq$ 30 | 44 (27.5) | 20 (6.3) | |
| Physical activity | | | 0.244 |
| No | 27 (16.9) | 70 (21.9) | |
| Yes | 133 (83.1) | 250 (78.1) | |
| Family history of BC | | | 0.008 |
| No | 142 (88.7) | 306 (95.6) | |
| Yes | 18 (11.3) | 14 (4.4) | |

No statistically significant differences between cases and controls were observed in terms of parity, oral contraceptive use, alcohol consumption, smoking, breastfeeding, and physical activity (p$>$0.05). In contrast, significantly higher proportions of cases than controls reported for

family history of BC (11.3% versus 4.4%), early menarche (15.0% versus 7.8%), overweight (33.1% versus 30.6%), and obesity (27.5% versus 6.3%).

Table 2 presents odds ratios (and 95% confidence intervals [95% CI]) for BC risk based on characteristics of each participant after adjusting for the effect of all variables in a multivariate model. Strongest associations were observed with family history of BC, menarche age, and BMI; these associations persisted after adjustment for the effect of all other factors. The aOR for the family history of BC was 2.5 (95% CI: 1.2-5.5).

**Table 2** Multiple logistic regression of breast cancer risk factors in women

| Variable | aOR [95% CI] | *p*-value |
|---|---|---|
| Age at menarche | | |
| $<$ 12 years | 2.3 [1.2-4.3] | 0.011 |
| $\geq$ 12 years | 1.0 | |
| Family history of BC | | |
| Yes | 2.5 [1.2-5.5] | 0.020 |
| No | 1.0 | |
| Body mass index (kg/m$^2$) | | |
| $<$ 25 | 1.0 | |
| 25-29.9 | 1.8 [1.1-2.7] | 0.014 |
| $\geq$ 30 | 7.3 [4.0-13.4] | $<$ 0.001 |

A statistically significant trend with age at early menarche and BC risk was also observed; women who started menstruating before the age of 12 had an increased risk of BC compared to women who started menstruating later, even after adjusting for the effect of all other risk factors (aOR = 2.3; 95% CI: 1.2-4.3). For BMI, we noted that women who were overweight (aOR = 1.8; 95% CI: 1.1-2.7) and obese (aOR = 7.3; 95% CI: 4.0-13.4) had a significantly elevated risk of BC compared to those with normal BMI.

# 4 Discussion

The etiology of BC is still poorly understood and known risk factors for BC account for only a small proportion of cases. Epidemiological studies in different populations have identified a range of well-established and probable BC risk factors [16, 17]. These include age, socioeconomic status, reproductive events, breastfeeding, BC family history, and lifestyle. However, most of epidemiological studies on BC involve subjects living in North America and Western Europe, regions that represent only a fraction of the world's population. Therefore, there is a need for further research on the epidemiology of BC in populations in less well-studied regions of the world, in order to better understand the etiology of BC [17]. This is the first epidemiological study on the risk factors for BC in the Congolese population.

The identification of women at high risk of developing BC is very important to prevent the onset of the disease. Because of the paucity of data among Congolese women, we decided to assess here the strength of the association between recognized risk factors and BC among Congolese women. Thus, well-established risk factors for BC identified in other populations, such as family history of BC, early menarche age, and overweight/obesity, had strongest associations with BC risk among Congolese women.

Comparing the BMI between cases and controls, there is a statistically significant difference between the two groups. Women who were overweight (aOR = 1.8) and obese (aOR = 7.3) had a significantly higher risk of breast cancer compared to those with normal BMI. Our data support the concept that obesity is a significant risk factor for disease, consistent with previous studies of different populations in different regions [18–21]. Overweight/obese women have reduced progesterone levels because obesity can cause anovulation and decreased progesterone production during the luteal phase. Obesity also increases endogenous estrogen levels and decreases sex hormone binding globulin, which increases free estradiol levels [7, 22]. According to García-Estévez *et al.* [23], the association between BC risk and obesity (overweight/obesity) varies with menopausal status. Some studies reported a negative correlation between obesity and BC risk in premenopausal women [24, 25]. In our study, no information on the status of menopause at the time of diagnosis was available. Elkum *et al.* [21] reported that the BC risk was significantly higher in overweight or obese Arab women before and after menopause. This significant association between obesity and BC risk was not found in the study by Hadjisavvas *et al.* [4].

In this study, we have shown that the BC family history is an independent predictor of BC. Women with a positive BC family history had an approximately three-fold increased risk of BC (aOR = 2.5). This is consistent with what has already been reported in various populations

in different geographic regions [4, 21, 26]. This also reflects the role of genetic and epigenetic modifications on important genes such as BRCA1 and BRCA2 in disease predisposition [27].

Our results showed that early menarche age is a risk factor for the BC development. Cases were more likely than controls to have had menarche before age 12 (aOR = 2.3). The BC risk is associated with several reproductive factors. It is well established that the BC risk increases with early menarche age [4, 12, 28]. This association is consistent with the hypothesis that the BC risk is related to the extent of mitotic activity of the breast. This activity is driven by estrogen and progesterone exposure during the luteal phase of the menstrual cycle [29], which determines the probability of tumorigenic somatic events [30]. As a result, early menarche age increases the period during which the breast is mitotically active and subsequently increases the BC risk. Like previous researchers, we have observed that an early age at menarche is associated with a high BC risk in our population.

The interpretation of our results should take into account certain limitations. First, because the study is cross-sectional, it precludes any relationship between outcomes and associated factors. Second, factors studied were based on respondent reports, except for the BMI, which was measured only once for cases and controls. Third, another limitation of this study was the inability to assess certain factors, e.g., hormone replacement therapy, early delivery at advanced age, education level, marital status, socioeconomic level, and medical history such as diabetes mellitus, diet, which would have been associated with BC. The future study should include these variables.

# 5 Conclusion

This study presents the first report on BC risk factors among Congolese women. Strongest associations with the BC risk in the Congolese population were observed with BC family history, early menarche, and overweight/obesity. Overall, these results support results of previous surveys of the descriptive epidemiology of BC risk factors. There is a need for more targeted prevention and early diagnosis campaigns among the Congolese population.

# List of abbreviations

**95% CI**: 95% confidence intervals
**aOR**: adjusted odds ratio
**BC**: breast cancer
**BMI**: body mass index
**DRC**: Democratic Republic of the Congo

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