Introduction

In Africa, invasive cervical cancer is the second most common cancer after breast cancer and the leading cause of cancer death among women with an estimated 99,038 new cases and 60,098 deaths in 2012 (Ferlay et al., 2013). In West Africa, incidence rates of invasive cervical cancer are estimated to be high in Senegal, Liberia, Mali and Ghana, and lower in Cote D’Ivoire and Togo relatively (Ferlay et al., 2013). These differences may reflect the wide cultural, geographic, ethnic and environmental variations that influence sexual behavior and the prevalence of sexually transmitted diseases in different parts of the continent (Morhason-Bello et al. 2013). They may also reflect methodological differences in the assessment of cancer incidence such as coverage by a cancer registry.

In Ghana, cervical cancer is the most common cancer among women (Ferlay et al., 2013). There is currently no national cervical screening program in Ghana. However, there are a few hospitals and organized bodies such as churches and corporate institutions that offer screening with the Pap smear, visual inspection with acetic acid, or human papillomavirus (HPV) DNA testing. This screening is offered on an opportunistic basis. Detailed data on the characteristics of women diagnosed with invasive cervical cancer in Ghana are not routinely collected. Additionally, there are currently no well-organized data on the follow-up of women diagnosed with invasive cervical cancer.

There are two public hospitals that offer treatment for cancer: Korle-Bu Teaching Hospital (KBTH), Accra and the Komfo Anokye Teaching Hospital (KATH), Kumasi. The Swedish Ghana Medical Center is a private oncology center that offers radiotherapy and chemotherapy to cancer patients. However, most cancer cases are seen and treated at KBTH and KATH. In addition to providing treatment to cancer patients, both hospitals have a cancer registry. We examined the characteristics of newly diagnosed invasive cervical cancer in the 2010-2013 time period for women presenting to the two hospitals in Ghana.

Materials and Methods

The method for identifying cases for this study has been described previously (Nartey et al., 2016; Nartey et al., 2017). In summary, the study population consisted of all histologically and clinically confirmed cases of invasive cervical cancer in KATH and KBTH from 2010
to 2013. Through the review of paper-based, electronic and pathology medical records at the Oncology Units and the Department of Obstetrics and Gynecology of the two hospitals, information on women newly diagnosed with invasive cervical cancer was collected. Physicians’ writing was occasionally difficult to read. In this instance, a physician was sought to help understand the sentences. Where the outcome of the disease was not documented in medical records, the patients or a relative was telephoned. Data were entered onto a standard questionnaire that included demographic details, comorbid conditions, treatment and follow-up.

Specific past medical history and comorbid conditions were considered present if they were documented in the patient’s medical records. The region of residence was derived from the place of residence recorded in the medical record. The occupations of women were also obtained from the medical record. Parity was recorded in the medical records for some women as 5+ and others 7+ births, necessitating three categorizations of parity to assess its relationship to the occurrence of cervical cancer. The International Federation of Gynecology and Obstetrics (FIGO) stage at diagnosis was dichotomized into localized (FIGO I-II) and advanced cancer (FIGO III-IV) and variables associated with advanced disease assessed by logistic regression.

Approval for this study was granted by the University of Otago Ethics (Health) Committee, Ghana Health Service Ethical Committee and the Committee on Human Research, Publication and Ethics of the Kwame Nkrumah University of Science and Technology (KNUST) and KATH, Ghana.

STATA was used to describe proportions or percentages of the variables of interest. A p-value of less than 0.05 was used to define statistical significance. Multivariate logistic regression was conducted to examine the effect of stage of disease on various factors while controlling for potential confounding. Variables such as region of residence and occupation which have been shown to impact the stage of the patient’s medical records. The region of residence was derived from the place of residence recorded in the medical record. The occupations of women were also obtained from the medical record. Parity was recorded in the medical records for some women as 5+ and others 7+ births, necessitating three categorizations of parity to assess its relationship to the occurrence of cervical cancer. The International Federation of Gynecology and Obstetrics (FIGO) stage at diagnosis was dichotomized into localized (FIGO I-II) and advanced cancer (FIGO III-IV) and variables associated with advanced disease assessed by logistic regression.

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STATA was used to describe proportions or percentages of the variables of interest. A p-value of less than 0.05 was used to define statistical significance. Multivariate logistic regression was conducted to examine the effect of stage of disease on various factors while controlling for potential confounding. Variables such as region of residence and occupation which have been shown to impact the stage of disease at presentation in relation to other factors. Younger women were more likely to be diagnosed with FIGO stage I-II disease compared with older women but the result did not achieve statistical significance (p=0.352). Women who resided in a metropolis were more likely to be diagnosed with FIGO stage III-IV disease (p=0.034). Additionally, women with no past medical history (p=0.652) and comorbidity (p=0.328) were more likely to be diagnosed with FIGO stage III-IV disease compared with those with any past medical history or comorbidity. Having comorbidities like hypertension and renal disease increase the risk of being diagnosed with FIGO stage III-IV disease (p<0.001).

About 1.1% of women had been screened (not part of the diagnostic process) before invasive cervical cancer

Results

For 49 and 23 medical folders of women diagnosed with invasive cervical cancer recorded in the electronic records at the Oncology Units at KATH and KBTH, respectively, the diagnosis of cervical cancer could not be confirmed. Thus, information for these women was not obtained. The review of paper-based and electronic medical records provided 1,915 records of women newly diagnosed with invasive cervical cancer from 2010 to 2013, 806 women from KATH and 1,109 women from KBTH (Figure 1).

Of the 806 women with invasive cervical cancer recorded at KATH, 83 were found to have records at both the Department of Obstetrics and Gynecology and the Oncology Unit. For these women, the records of the Oncology Unit were used as they were more complete. Forty-three women recorded in the Oncology Unit electronic records at KATH did not appear to have invasive cervical cancer after review of the paper-based records. Of these women, the diagnosis of 13 was cancer of the ovary, 10 cancer of the endometrium, 8 cancer of the vulva, 7 cancer of the uterus and 2 had other diagnoses.

Out of 1,109 women with invasive cervical cancer recorded at KBTH, 61 women did not have the diagnosis confirmed after review of paper-based medical records. For 19 the diagnosis was cancer of the ovary, 18 cancer of the endometrium, 16 cancer of the vulva and 18 had other diagnoses. Three women at KBTH had records at both the Department of Obstetrics and Gynecology and the Oncology Unit, so the records from the Oncology Unit were used. After exclusion of records indicating a diagnosis that was not cervical cancer and duplicates, the records of 1,725 women with invasive cervical cancer were identified.

For 359 (20.8%) women no telephone number was available (data not shown). Among those with a telephone number, further information was obtained for 829 (48.1%) women. Access to the telephone was not often available where clinical staff did not specifically ask for a contact telephone number.

Table 1 shows the proportion of women with early and late stage of disease at presentation in relation to other factors. Younger women were more likely to be diagnosed with FIGO stage I-II disease compared with older women but the result did not achieve statistical significance (p=0.352). Women who resided in a metropolis were more likely to be diagnosed with FIGO stage III-IV disease (p=0.034). Additionally, women with no past medical history (p=0.652) and comorbidity (p=0.328) were more likely to be diagnosed with FIGO stage III-IV disease compared with those with any past medical history or comorbidity. Having comorbidities like hypertension and renal disease increase the risk of being diagnosed with FIGO stage III-IV disease (p<0.001).

About 1.1% of women had been screened (not part of the diagnostic process) before invasive cervical cancer

![Figure 1. Flow Chart of Women Included](image-url)
Table 1. Proportion of Women with Early and Late Stage of Disease at Presentation in Relation to Other Factors

| Characteristic                     | FIGO stage at presentation |      |
|-----------------------------------|----------------------------|------|
|                                   | I-II                       | III-IV | Total |
| Age group (years)                 |                           |       |       |
| ≤29                               | 5                         | 1      | 11    | 1.4  | 16 | 1.2 |
| 30-39                             | 40                        | 7.7    | 71    | 9    | 111 | 8.5 |
| 40-49                             | 96                        | 18.6   | 165   | 20.8 | 261 | 19.9 |
| 50-59                             | 152                       | 29.4   | 196   | 24.7 | 348 | 26.6 |
| ≥60                               | 224                       | 43.3   | 350   | 44.1 | 574 | 43.8 |
| Chi-square                        |                           |        |       |      |     |      |
| Metropolis                        | 278                       | 53.8   | 407   | 51.7 | 685 | 52.5 |
| Urban                             | 153                       | 29.6   | 254   | 32.2 | 407 | 31.2 |
| Semi-urban                        | 45                        | 8.7    | 90    | 11.4 | 135 | 10.3 |
| Non-Ghana residents               | 41                        | 7.9    | 37    | 4.7  | 78  | 6   |
| Chi-square                        |                           |        |       |      |     |      |
| Tertiary                          | 20                        | 7.3    | 21    | 5.5  | 41  | 6.2 |
| High school                       | 101                       | 36.6   | 103   | 26.8 | 204 | 30.9 |
| Primary                           | 42                        | 15.2   | 63    | 16.4 | 105 | 15.9 |
| None                              | 113                       | 40.9   | 197   | 51.3 | 310 | 47  |
| Parity 1                          |                           |        |       |      |     |      |
| 0-2                               | 71                        | 14     | 114   | 14.8 | 185 | 14.5 |
| 3-5                               | 187                       | 36.9   | 264   | 34.3 | 451 | 35.3 |
| 6-8                               | 173                       | 34.2   | 276   | 35.8 | 449 | 35.2 |
| 9-11                              | 59                        | 11.7   | 105   | 13.7 | 164 | 12.9 |
| 12-15                             | 16                        | 3.2    | 10    | 1.3  | 26  | 2   |
| 16-20                             | 0                         | 0      | 1     | 0.1  | 1   | 0.1 |
| Fisher’s exact                    |                           |        |       |      |     |      |
| Parity 2                          |                           |        |       |      |     |      |
| 0-2                               | 71                        | 14     | 114   | 14.7 | 185 | 14.5 |
| 3-4                               | 119                       | 23.5   | 173   | 22.4 | 292 | 22.8 |
| 5+                                | 316                       | 62.5   | 486   | 62.9 | 802 | 62.7 |
| Parity 3                          |                           |        |       |      |     |      |
| 0-3                               | 127                       | 25.1   | 202   | 26.2 | 329 | 25.8 |
| 4-6                               | 187                       | 37     | 281   | 36.5 | 468 | 36.7 |
| 7+                                | 192                       | 37.9   | 287   | 37.3 | 479 | 37.5 |
| Medical history                   |                           |        |       |      |     |      |
| No                                | 487                       | 94.4   | 738   | 93.8 | 1,225 | 94 |
| Yes                               | 29                        | 5.6    | 49    | 6.2  | 78  | 6   |
| Comorbidity count                 |                           |        |       |      |     |      |
| None                              | 296                       | 57.4   | 460   | 58.4 | 756 | 57.9 |
| 1 other disease                   | 178                       | 34.5   | 253   | 32.1 | 431 | 33.1 |
| 2 other diseases                  | 39                        | 7.5    | 62    | 7.9  | 101 | 7.8 |
| 3 and more diseases               | 3                         | 0.6    | 13    | 1.6  | 16  | 1.2 |
| Fisher’s exact                    |                           |        |       |      |     |      |

Table 1. Continued

| Characteristic                     | FIGO stage at presentation |      |
|-----------------------------------|----------------------------|------|
|                                   | I-II                       | III-IV | Total |
| Major diseases*                   |                           |       |       |
| Hypertension                      | 129                       | 64.5   | 144   | 53.5 | 273 | 58.2 |
| Diabetes                          | 39                        | 19.5   | 39    | 14.5 | 78  | 16.6 |
| Respiratory diseases              | 11                        | 5.5    | 19    | 7.1  | 30  | 6.4 |
| Renal disease                     | 5                         | 2.5    | 34    | 12.6 | 39  | 8.3 |
| HIV                               | 10                        | 5      | 12    | 4.5  | 22  | 4.7 |
| Gastrointestinal disease          | 5                         | 2.5    | 15    | 5.6  | 20  | 4.3 |
| Fisher’s exact                    |                           |        |       |      |     |      |

Diagnosis. The majority of women had at least two diagnostic investigations (75.0%) (Table 2). The most common investigation undertaken was a cervical biopsy, performed for 95.5% of women who had diagnostic investigations. The use of imaging tests such as computed tomography (CT scan), magnetic resonance imaging (MRI) or colposcopy was uncommon. However, other investigations such as abdominal ultrasound, X-ray, liver function tests, urine analysis, full blood count and other blood tests were frequently done (data not shown).

Table 2. Diagnostic Investigations

| Characteristic                     | Number (1,725) | % |
|-----------------------------------|---------------|---|
| Investigation count               |               |   |
| None                              | 74            | 4.3 |
| 1 investigation                   | 142           | 8.2 |
| 2 investigations                  | 1,294         | 75 |
| 3 or more investigations          | 56            | 3.3 |
| Missing                           | 159           | 9.2 |
| Investigation                     |               |   |
| Cervical screening                | 17            | 1.1 |
| Biopsy                            | 1,425         | 95.5 |
| Colposcopy                        | 5             | 0.2 |
| CT scan                           | 44            | 3  |
| MRI                               | 5             | 0.3 |
| Other                             | 1,404         | 94.1 |

The majority of women have three or more other investigations which has not indicated in the number as all other investigations were categorized as “other”. This includes full blood count, abdominopelvic ultrasound, chest X ray; Columns do not add up to 100% as some women have more than one investigation.
associated with a greater risk (OR: 1.6; 95% CI: 0.9-3.1) of having stage III-IV compared with stage I-II disease. More cases were diagnosed at advanced stages than localized disease, however, women aged 30-39 years were more likely to be diagnosed with localized disease (OR: 3.3; 95% CI: 1.3-8.1) after adjustment for region of residence, parity, occupation, education, marital status and ethnicity. None of the women aged 30-39 years were diagnosed by screening.

A summary of the treatment women received and their pattern of clinical follow-up after the first consultation is shown in Table 4. Treatment with radiation was received by 55.4% of women. Of those who had radiotherapy, the majority of women received both external beam radiation and brachytherapy (53.0%). Just 7.5% of women offered chemotherapy did not receive it. Among women who were offered chemotherapy but did not receive it (29 women), 2 died before treatment was given, one defaulted treatment and another was unable to pay for the treatment (data not shown).

Sixty-one percent (61%) of women with cervical cancer attended at least one clinical follow-up appointment. There was no clinical follow-up information for most of the women whose diagnosis was obtained from the electronic database and paper-based records at the Department of Obstetrics and Gynecology at KBTH.

Table 3. Logistic Regression of Stage at Presentation in Relation to Other Factors

| Characteristic          | Stage I-II | Stage III-IV |
|-------------------------|------------|--------------|
|                         | Number (518) | % | Number (793) | % | Odd ratio* | 95% CI | p-value |
| Age group (years)       |            |     |            |     |           |        |
| ≤29                     | 5          | 1   | 11         | 1.4 | 1         | reference |
| 30-39                   | 40         | 7.7 | 71         | 9   | 3.3       | 1.3-8.1 | 0.01    |
| 40-49                   | 96         | 18.6| 165        | 20.8| 1.6       | 0.9-2.7 | 0.102   |
| 50-59                   | 152        | 29.4| 196        | 24.7| 1.5       | 0.9-2.4 | 0.124   |
| ≥60a                    | 224        | 43.3| 350        | 44.1|           |         |         |
| Region of residence     |            |     |            |     |           |        |
| Metropolis              | 278        | 53.8| 407        | 51.7| 1         | reference |
| Urban                   | 153        | 29.6| 254        | 32.2| 1.3       | 0.9-1.9 | 0.221   |
| Semi-urban              | 45         | 8.7 | 90         | 11.4| 1.6       | 0.9-3.1 | 0.143   |
| Non-Ghana residents     | 41         | 7.9 | 37         | 4.7 | 0.8       | 0.1-11.0| 0.851   |
| Parity                  |            |     |            |     |           |        |
| 0-2                     | 71         | 14  | 114        | 14.7| 1         | reference |
| 3-4                     | 119        | 23.5| 173        | 22.4| 1         | 0.6-1.9 | 0.925   |
| 5+                      | 316        | 62.5| 486        | 62.9| 1.2       | 0.7-2.1 | 0.537   |
| Occupation              |            |     |            |     |           |        |
| Teacher/businesswoman   | 15         | 3.8 | 11         | 1.8 | 1         | reference |
| Trader/farmer           | 327        | 83.4| 550        | 90  | 2.7       | 0.6-11.5| 0.176   |
| Seamstress/hairdresser  | 14         | 3.6 | 20         | 3.3 | 1.4       | 0.2-8.3 | 0.739   |
| Other                   | 36         | 7.2 | 30         | 4.9 | 1.7       | 0.4-7.1 | 0.479   |
| Formal education        |            |     |            |     |           |        |
| Tertiary                | 101        | 36.6| 103        | 26.8| 1         | reference |
| High school             | 20         | 7.3 | 21         | 5.5 | 0.5       | 0.2-1.4 | 0.173   |
| Primary                 | 42         | 15.2| 63         | 16.4| 0.7       | 0.3-2.1 | 0.552   |
| None                    | 113        | 40.9| 197        | 51.3| 1.1       | 0.4-3.0 | 0.877   |
| Marital status          |            |     |            |     |           |        |
| Single                  | 65         | 13.1| 101        | 13.4| 1         | reference |
| Married                 | 266        | 53.6| 368        | 48.7| 1.1       | 0.6-1.9 | 0.778   |
| Other                   | 165        | 33.3| 287        | 37.9| 1.7       | 0.9-3.2 | 0.08    |
| Ethnicity               |            |     |            |     |           |        |
| Ga/Adangbe              | 54         | 11.2| 67         | 9.3 | 1         | reference |
| Ewe                     | 52         | 10.8| 78         | 10.8| 1.9       | 0.9-4.1 | 0.092   |
| Akan                    | 288        | 59.8| 454        | 62.8| 1.8       | 1.0-3.4 | 0.068   |
| Non-Ghana ethnicity     | 42         | 8.7 | 38         | 5.3 |           |         |         |
| Other Ghanaian ethnicity| 46         | 9.5 | 86         | 11.8| 2         | 0.9-4.7 | 0.091   |

*Adjusted for all factors in the table; †Omitted because of collinearity with others.
Table 4. Oncology Treatment and Follow-up Information from Medical Records

| Characteristic          | Number (1,725) | %   |
|-------------------------|----------------|-----|
| Received radiotherapy   |                |     |
| No                      | 567            | 32.9|
| Yes                     | 955            | 55.4|
| Missing                 | 203            | 11.7|
| Type of radiotherapy*   |                |     |
| External beam only      | 436            | 45.7|
| Brachytherapy only      | 5              | 0.5 |
| Both                    | 506            | 53  |
| Missing                 | 8              | 0.8 |
| Offered chemotherapy**  |                |     |
| No                      | 1,132          | 65.6|
| Yes                     | 387            | 22.4|
| Missing                 | 206            | 12  |
| At least one clinical follow-up attendance | | |
| No                      | 463            | 26.8|
| Yes                     | 1,055          | 61.2|
| Unknown                 | 207            | 12  |
| Follow-up investigation† |                |     |
| No                      | 282            | 26.7|
| Yes                     | 768            | 72.8|
| Unknown                 | 5              | 0.5 |
| Investigations‡         |                |     |
| CT scan                 | 50             | 6.5 |
| MRI                     | 1              | 0.1 |
| Vaginal vault smear     | 6              | 0.8 |
| Other investigations    | 757            | 98.6|
| Recurrence              |                |     |
| No                      | 1,511          | 87.6|
| Yes                     | 55             | 3.2 |
| Unknown                 | 159            | 9.2 |
| New metastases          |                |     |
| No                      | 1,499          | 86.9|
| Yes                     | 67             | 3.9 |
| Unknown                 | 159            | 9.2 |
| Status (whether women were alive or dead) | | |
| Dead                    | 128            | 7.4 |
| Unknown                 | 1,597          | 92.6|
| Status (from telephone interview)§ | | |
| Dead                    | 502            | 29.1|
| Alive                   | 327            | 19  |
| Missing                 | 896            | 51.9|
| Follow-up (women alive)\| | | |
| No                      | 55             | 16.8|
| Yes                     | 249            | 76.2|
| Unstated                | 23             | 7   |

§ Columns do not add up to 100% as some women received more than one investigation; † Patients status obtained by telephone enquiry; ‡ Only those who received radiotherapy; **Only those who received chemotherapy; † Only those who had at least one clinical follow-up attendance.

72% of women that had clinical follow-up had further investigations. This was mostly for the investigation of metastases and recurrence. Most women who had clinical follow-up had abdominopelvic ultrasound, x-ray, blood or urine analysis. Among all women with cervical cancer, 3.2% had a recurrence and new metastases diagnosed during clinical follow-up. The most common metastatic sites were the liver or lungs (data not shown). Other metastases occurred in the kidney, bladder, bones, brain and ovaries, with regional spread common for some of these sites. Some patients also suffered recurrence in the pelvic wall, bladder, rectum and lymph nodes.

Among women with cervical cancer for whom further information was sought by telephone, 502 (29.1%) women were dead when contact was sought (Table 4). Among women alive, 76.2% were still undergoing medical review at various hospitals (including KATH and KBTH) at the time of telephone interview. Overall, 561 deaths occurred and 324 women were alive at the end of data collection (data not shown). This number included women for whom status (128 deaths) was documented in the medical record. Sixty-nine deaths documented in medical records were also confirmed by telephone interview with relatives. Among deaths recorded in the medical records, the principal cause of death was not documented for 97.7%. Deep vein thrombosis, cervical cancer and uremia due to metastatic cervical cancer were the common causes of death for those for whom a cause of death was listed (data not shown).

**Discussion**

This is the first study conducted in Ghana to describe the basic features, methods of diagnosis and treatment received for women diagnosed with invasive cervical cancer. The increased risk of advanced disease in women aged 30-39 years may be attributed to individuals associating cervical cancer to older women. Thus, they may not initially associate their signs and symptoms to invasive cervical cancer and likely to be diagnosed at late state of presentation.

Women with invasive cervical cancer had high parity in this study. This is consistent with other studies conducted in Ghana (Nyekyer, 2000) and elsewhere (Hammouda et al., 2005; Munoz et al., 2002; Franceschi et al., 2003). Although parity has begun to decline in Ghana, it is still very high compared with high-income countries (Ghana Statistical Service, 2013). In most rural and a few peri-urban areas in Ghana, a high number of children serve as social security in old age for parents. That is, the higher the number of children a couple has, the higher likelihood that some may survive to provide for their parents in the future. Considering that most women diagnosed with invasive cervical cancer were from rural areas, this might account for the high parity in the study. Most women did not have significant past medical history or comorbidities. However, women may have under-reported their past medical history as the majority of clinicians rely on patient recall in Ghana if it is not recorded in the medical records. Like other sub-Saharan countries, pre-treatment assessment is usually sub-optimal. Investigations like...
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near Accra or Kumasi. A woman’s belief about disease
for accommodation if they do not have a relative living
two hospitals is costly and patients may have to arrange
oncology units in the country. Transportation to these
alone or chemoradiation are referred to the two public
part of their hospital treatment (Akazili et al., 2014).

Despite the availability of MRI and CT scanners in
the centers that treat cervical cancer, they were hardly
used. Positron emission tomography (PET) is unavailable
in Ghana. Together, or individually, MRI, CT scan and
PET may increase the sensitivity and specificity of the
detection of lymph node and pelvic wall spread but have
not been incorporated into the FIGO system of staging.
Examination under anesthesia including cystoscopy and
proctoscopy was done only in a limited number of cases,
and pain and discomfort is likely to reduce accurate staging
of the disease. Therefore the extent of existing disease is
likely to be under-reported. As most cervical cancer was
diagnosed at an advanced stage, most women were likely
to have had more advanced disease at diagnosis than that
indicated in their medical record (Nartey et al., 2017).

Some of the women defaulted treatment after first
assessment. For women to receive either radiotherapy
alone or chemoradiation, they must progress through a
series of steps, including referral to the Oncology Unit,
booking for consultation (which varied depending on the
urgency of the case), consultation, request for laboratory
tests after consultation, review by an oncologist,
simulations or mark-up for radiotherapy, consent for
treatment and receipt of treatment. Although Ghana has a
national health insurance scheme, out-of-pocket payment
constitutes a major part of the hospital payment system.
Insured patients may still be required to pay a significant
part of their hospital treatment (Akazili et al., 2014).
Patients may have to pay to receive both radiotherapy and
chemotherapy. Thus, it is plausible that some women who
did not receive treatment were unable to pay. Additionally,
distance to the two oncology centers may influence
whether treatment is received. Public hospitals are spread
throughout Ghana and vary from large urban facilities with
several beds to small rural health centers and health posts
but only the two public hospitals that contributed patients
for the study had cancer treatment units.

Although the majority of women with cervical cancer
in this study lived in the Greater Accra and Ashanti
regions, most were from rural areas. They were first likely
to access care through rural health facilities which are
often under-resourced. Women who required radiotherapy
alone or chemoradiation are referred to the two public
oncology units in the country. Transportation to these
two hospitals is costly and patients may have to arrange
for accommodation if they do not have a relative living
near Accra or Kumasi. A woman’s belief about disease
causation may also influence her health seeking behavior.
The majority of Ghanaians attribute disease causation to
spiritual causes and may therefore resort to alternative
and complementary medicine for treatment rather than
orthodox medicine that includes surgery, radiotherapy
and chemotherapy (Yarney et al. 2013). The frequency
and extent of the side effects of orthodox medicine are
exaggerated in the media and internet with the best chances
of cure commonly attributed to spiritual intervention.

The majority of women who received radiotherapy
had both external beam radiation and brachytherapy. The
actual and optimum radiotherapy utilization rates in Ghana
have been estimated to be 9% and 51%, respectively
(Rosenblatt et al., 2015). External beam therapy alone
is recommended for some women who require palliative
treatment. Considering that the majority of women with
invasive cervical cancer in this study were diagnosed
with advanced cancer, we expect many women received
treatment with palliative rather than curative intent.

Limitations of the study included the incomplete
perspective obtainable from medical notes due to the
informal and abbreviated way they were often written.
Hospital records were sometimes incomplete and
information about potential factors of interest were not
consistently available. Medical folders of gynecological
patients at the Department of Obstetrics and Gynecology
at KBBTH were not kept in the hospital. Almost all patients
took their medical folders home and returned with them at
each subsequent visit. Only a few gynecological patient
folders were kept in the department. These folders were
for patients who forgot to pick them up after admission
or who had died in hospital. The electronic database
recorded some basic information (mainly descriptive)
such as name, age, parity, residence, diagnosis, death and
some information on the treatment received. There were
a lot of data fields that required entry in the electronic
record. However, only a few of these were fully used.
Some records did not list the diagnosis. Therefore, it
was initially difficult to know which women had cervical
cancer and whether cervical cancer was correctly
recorded without examining the entire record. Checking
through the medical folders at the department increased
completeness as for some women the folders missing
a diagnosis in the electronic records were left in the
department. Additionally, some cases missing a diagnosis
in the electronic records at the Department of Obstetrics
and Gynecology were abstracted from the Oncology Unit
files, as most women were referred to the Oncology Unit
for treatment. The diagnosis for some women recorded
in the electronic record at the two hospitals could not be
confirmed after review of paper-based medical records.
This suggests that the annual reports of the two hospitals
are likely to under-report the number of different cancers
treated. For instance, only 183 women with cervical cancer
were reported by the Oncology Unit at KBBTH in the 2013
annual report (Korle Bu Teaching Hospital, 2013) yet
1,105 were found in this study.

There were difficulties interviewing some patients and
relatives by telephone. The telephone numbers listed for
some women were no longer correct and these patients
were not traceable. Other telephone numbers were no
longer in use. Additionally, some women did not have telephone numbers. A few patients and relatives were not willing to provide the information sought. This was more common when the patient had died and a relative was contacted. However, during the telephone interviews with patients and relatives, their views about the hospital care received were expressed. In particular, it was found that patients and relatives would prefer periodic follow-up by hospital staff. We were not able to examine how long women were followed-up by clinical services.

In conclusion, there is scope for a more systematic assessment and treatment for patients with cervical cancer in Ghana. Improving access to health care is important to improve the mortality and survival rates from invasive cervical cancer. Additionally, the monitoring of treatment and outcomes will provide information to improve health services. Improvements in data quality will enable more complete assessment of cervical cancer presentation and management for the development of treatment guidelines and the monitoring of improvements in cervical cancer control.

**Abbreviations**

- CT: Computed Tomography
- FIGO: International Federation of Gynecology and Obstetrics
- KATH: Komfo Anokye Teaching Hospital
- KBTH: Korle-Bu Teaching Hospital
- MRI: Magnetic Resonance Imaging
- PET: Positron Emission Tomography

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**Conflict of interest**

The authors have no conflict of interest to disclose.

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