Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 2900-2905 | ISSN:2251-6727

Diagnostic Accuracy of MRI and Clinical Examination in Estimating Tumor Size in Early-Stage Cervical Carcinoma

Zakia Sultana[1*], Md. Husnaion Zubery[2], Mst. Jakanta Faika[3], Mahmuda Islam[4], Mossa Nupur Aktar[5], Nadia Islam[6], Falguni Binte Rahman[7], A.K.M. Anowar Hossain[8]

[1]Medical Officer, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh.

[2]Junior Consultant, Department of Radiology & Imaging, Rajshahi Medical College Hospital, Rajshahi, Bangladesh.

[3]Medical Officer, Department of Gynecological Oncology, National Institute Of Cancer Research & Hospital (NICRH), Dhaka, Bangladesh.

[4]Assistant Register, Shaheed M. Monsur Ali Medical College and Hospital, Sirajgonj, Bangladesh.

[5]Assistant Surgeon, Upazila Health Complex, Dagonvuiya, Feni, Bangladesh.

[6]Assistant Register, 250-bedded Mohammed Ali Hospital, Bogura, Bangladesh.

[7]Assistant Professor, Department of Pharmacology & Therapeutics, Rajshahi Medical College, Rajshahi, Bangladesh.

[8]Associate Professor, Department of Radiology & Imaging, Bangladesh Medical University, Dhaka, Bangladesh.

Corresponding Author: Zakia Sultana, Medical Officer, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh.

(Received: 16 May 2025 Revised: 20 June 2025 Accepted: 24 July 2025)

KEYWORDS

cervical cancer, tumor size, MRI, clinical examination, histopathology.

ABSTRACT:

Background: Cervical cancer is a leading cause of cancer-related mortality among women globally, particularly in developing countries. Accurate tumor size estimation is critical for staging and treatment planning in early-stage cervical carcinoma. This study aimed to evaluate the diagnostic accuracy of MRI and clinical examination in estimating tumor size in early-stage cervical carcinoma.

Methods: A cross-sectional study was conducted at the Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from January 2020 to December 2020. A total of 40 patients diagnosed with early-stage cervical carcinoma (FIGO stage Ib1–IIa1) were enrolled in the study. Tumor size was recorded by clinical examination, MRI, and histopathology post-radical hysterectomy. Pearson's correlation and size estimation accuracy within ±0.5 cm was analyzed.

Results: MRI showed a stronger correlation with histopathology ($r = 0.7567$; $p = 0.001$) than with clinical examination ($r = 0.5707$; $p = 0.001$). MRI demonstrated higher accuracy in tumors ≥2.0 cm, particularly in the 2.0–3.9 cm group (22.5% vs. 7.5% for clinical). MRI also outperformed clinical examination in estimating tumors ≥4.0 cm (30.0% vs. 25.0% accuracy within ±0.5 cm).

Conclusion: MRI is more accurate than clinical examination in tumor size estimation and should be integrated into standard cervical cancer staging protocols.

Introduction

Cervical cancer remains one of the leading causes of cancer-related mortality among women globally, especially in developing countries. The global burden in 2018 was estimated at 570,000 new cases and 311,000 deaths, with over 85% of deaths occurring in low- and

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 2900-2905 | ISSN:2251-6727

middle-income countries [1]. In Bangladesh, cervical carcinoma represents a major public health concern due to late-stage diagnosis and limited access to screening and diagnostic services [2].

Proper estimation of tumor size is critical to staging, prognosis, and treatment plans. Under the revised FIGO 2018 staging system, tumor size has been brought out in determining IB sub-staging of stage IB: IB1 (<2 cm), IB2 (2 to 4 cm), and IB3 (>4 cm) [3]. Clinical Importance The divisions are clinically significant because they affect treatment choices, such as whether one is suitable for fertility-sparing interventions [4].

Clinical staging, especially examination under anesthesia (EUA), has traditionally played the key role in cervical cancer evaluation [5]. Clinical assessment can, however, be limited by observation of variability between examiners, the anatomy of the patient and characteristics of the tumor [6]. Such constraints may lead to under- or over-estimation of tumor size, and this will result in encountering a serious problem in women with endophytic or non-palpable tumors. The presence of endophytic tumors, obesity, etc., may interfere with proper palpation, including the determination of size [7].

Magnetic resonance imaging (MRI) has emerged as a better method of staging cervical cancer because of its great power in soft tissue and the fact that it is non-invasive [8]. It enables accuracy in the assessment of tumor size, parametrial involvement, and invasion of nearby organs, which is paramount in staging and therapeutic choice [9]. The research has illustrated that both MRI and clinical examination do not differ in the context of tumor size and staging accuracy; however, MRI is superior to clinical examination in stage 1 and less severe diseases [10,11].

MRI has its limitations, notwithstanding its benefits. There may be overestimation caused by the inflammation of the surroundings or the underestimation of the tumors having poor enhancement [12]. Also, its availability and affordability are serious obstacles towards large-scale application in low-resource contexts, like Bangladesh.

Local data comparing MRI and clinical examination with histopathological standards of tumor size estimation in early cervical cancer patients is not sufficient. As it is critical that individualized management of a patient is based on accurate preoperative staging, a direct assessment of these approaches is justified. The study aims to evaluate the diagnostic efficiency of MRI and clinical examination in measuring the size of the tumor in the early stage of cervical carcinoma, as the gold standard is histopathological measurement.

Methodology & Materials

This was a cross-sectional study conducted at the Department of Gynecological Oncology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh. The study was carried out from January 2020 to December 2020. A total of 40 patients diagnosed with early-stage cervical carcinoma (FIGO stage Ib1 to IIa1) were enrolled.

Sample Selection:

Inclusion Criteria:

- Patients aged 18 years or older.
- Histologically confirmed cervical carcinoma (stage Ib1 to IIa1).
- Underwent clinical examination and MRI before surgery.
- Underwent radical hysterectomy with available pathological staging.

Exclusion Criteria:

- Advanced stage cervical cancer (stage IIa2 and beyond).
- History of sub-total hysterectomy.
- Pregnancy or coexisting ovarian tumors.

Data Collection and Study Procedure:

All patients underwent clinical staging under anesthesia per FIGO 2018 guidelines. MRI was performed and interpreted by experienced radiologists. Tumor size was recorded from both clinical and MRI assessments. After radical hysterectomy, specimens were sent for histopathological analysis. Data were collected using a standardized, pre-tested questionnaire. Data were analyzed using SPSS version 23.0. Descriptive statistics summarized tumor size across modalities. Pearson correlation coefficients assessed the relationship between MRI, clinical, and histopathological tumor sizes. Estimation accuracy within ±0.5 cm and 0.5–1.0 cm differences was also calculated. A p-value <0.05 was considered statistically significant. Ethical approval was

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 2900-2905 | ISSN:2251-6727

obtained, and informed written consent was secured from all participants, with confidentiality strictly maintained.

Results

Table 1: Distribution of the study population according to tumor size (n=40)

Tumor size	Clinical	MRI	Histopathology
	Number of patients (%)	Number of patients (%)	Number of patients (%)
1.5-2.0 cm	07 (17.5)	07 (17.5)	08 (20.0)
2.0-3.9cm	25 (62.5)	25 (62.5)	20 (50.0)
4.0-7.0 cm	08 (20.0)	08 (20.0)	12 (30.0)
Mean tumor size (Histopathology)			3.13±1.14
Range			1.5-5.0 cm

Table 1 presents the distribution of tumor sizes based on clinical examination, MRI, and histopathological measurements. Most tumors were categorized within the 2.0–3.9 cm range by all three methods. Histopathology recorded 50% of tumors in this category, MRI 62.5%, and clinical examination also 62.5%. The mean tumor size by histopathology was 3.13 ± 1.14 cm, with a range of 1.5–5.0 cm.

Table 2: Comparison of differences in Clinical and MRI size of tumor based on histopathological tumor size (n=40)

Tumor Size	Accuracy (≤0.5 cm difference)		Accuracy (>0.5–1.0 cm difference)	
	Clinical n (%)	MRI n (%)	Clinical n (%)	MRI n (%)
<2.0 cm	1 (2.5)	1 (2.5)	0 (0.0)	0 (0.0)
2.0–3.9 cm	3 (7.5)	9 (22.5)	0 (0.0)	0 (0.0)
≥4.0 cm	10 (25.0)	12 (30.0)	5 (12.5)	2 (5.0)

Table 2 describes the differences between tumor sizes estimated by clinical examination and MRI compared with histopathological findings. In the 2.0–3.9 cm group, MRI matched pathology within ±0.5 cm in 22.5% of cases, while clinical examination did so in only 7.5%. MRI also demonstrated higher accuracy in tumors ≥4.0 cm, with 30% of cases within ±0.5 cm of pathological size compared to 25% for clinical estimation.

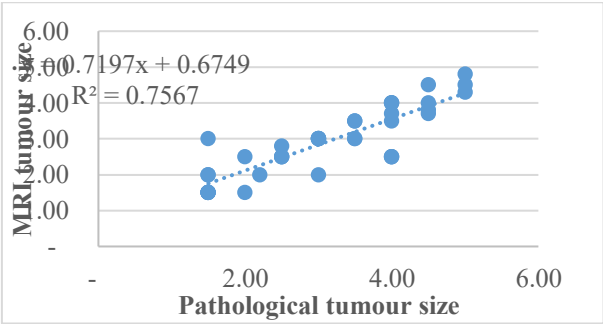

Figure 1: Scatter diagram illustrates positive correlation (r=0.7567; p=0.001) between histopathological and MRI tumor size.

Figure 1: scatter diagram showing the predictability of the relationship of tumor size obtained in MRI, where the histopathologic tumor size (independent variable) is plotted on the X axis and the MRI tumor size (dependent variable) is plotted on the Y axis. It shows a strong linear positive correlation of the MRI tumor size, as most of the values are closely approximated by the line of best fit.

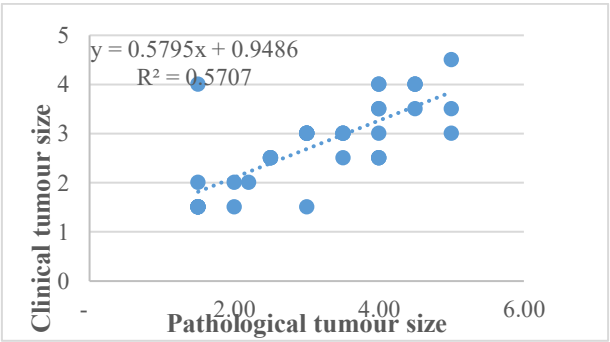

Figure 2: Scatter diagram illustrates positive correlation (r=0.5707; p=0.001) between histopathological and clinical tumor size.

Figure 2: scatter diagram showing the predictability of the relationship of tumor size obtained in clinical

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 2900-2905 | ISSN:2251-6727

examination, where the histopathologic tumor size (independent variable) is plotted on the X axis and clinical tumor size (dependent variable) is plotted on the Y axis. It shows a moderate linear positive correlation of the clinical tumor size, as most of the values are approximated with the line of best fit.

Table 3: Correlation Coefficients Between Tumor Size Estimation Methods and Histopathology

Method	Correlation Coefficient (r)	p-value
MRI vs. Histopathology	0.7567	0.001
Clinical vs. Histopathology	0.5707	0.001

Table 3 summarizes correlation coefficients for both staging modalities. MRI exhibited a higher correlation (r = 0.7567) with histopathological tumor size compared to clinical examination (r = 0.5707), reinforcing its diagnostic reliability.

Discussion

This study aimed to compare the accuracy of clinical examination and MRI in estimating tumor size against histopathological findings in patients with early-stage cervical carcinoma. The results indicate that MRI provides superior accuracy, particularly in tumors ≥2.0 cm, which aligns with findings by Bourgioti et al., who reported that MRI outperforms pelvic examination in assessing cervical tumor size [9].

Our findings showed that MRI had a strong correlation with histopathological tumor size (r = 0.7567), whereas clinical examination demonstrated a moderate correlation (r = 0.5707). These results are consistent with Unni et al., who found MRI more reliable than clinical assessment in early-stage cervical cancer [11]. Similar conclusions were drawn by Sozzi et al., who emphasized MRI's greater consistency in preoperative staging [7].

In the 2.0–3.9 cm group, MRI matched pathology within ±0.5 cm in 22.5% of cases, compared to 7.5% for clinical examination. These data reinforce the notion that MRI offers greater precision in intermediate-size tumors, where management strategies often vary. Lee et al. highlighted similar outcomes, indicating the importance of imaging in determining surgical eligibility for patients in this size category [10].

In the ≥4.0 cm category, MRI again outperformed clinical examination with 30% of estimates accurate within ±0.5 cm, compared to 25% for clinical staging. Nicolet et al. noted MRI may slightly overestimate tumor dimensions due to surrounding inflammation, but this did not significantly impact accuracy in our study [12]. Conversely, clinical examination had a higher rate of size overestimation and underestimation, especially in endophytic tumors.

MRI's strength lies in its high soft tissue contrast and multiplanar imaging capabilities, which allow better visualization of the cervix and adjacent structures. Hori et al. described how these advantages translate to more accurate tumor boundary delineation, particularly in complex anatomical cases [13].

However, clinical examination remains relevant, especially in low-resource settings. Bleker et al. emphasized that experienced clinicians can still offer reasonably accurate assessments, particularly when MRI is not accessible [14]. Despite this, our results demonstrate that reliance on clinical staging alone may result in misclassification, potentially leading to suboptimal treatment decisions.

The correlation strength shown in Table 3 underscores the importance of integrating imaging into preoperative staging protocols. FIGO's 2018 revision to include imaging and pathological data reflects a shift toward evidence-based, multimodal staging strategies [3]. This evolution is especially significant in regions like Bangladesh, where standardized MRI use could help optimize cervical cancer management.

The study's implications are twofold: (1) MRI should be the preferred modality for estimating tumor size in early-stage cervical cancer; and (2) clinical examination, though valuable, is less reliable when used alone. Furthermore, MRI accuracy supports its utility in fertility-sparing treatment planning, where tumor size must be precisely measured to avoid overtreatment or undertreatment.

Nonetheless, accessibility to MRI remains a challenge in many settings. Rubens et al. and Sauer et al. both highlighted infrastructural and financial barriers in developing nations [4,15]. Expanding MRI access and

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(3), 2900-2905 | ISSN:2251-6727

training radiologists in cervical imaging protocols could mitigate these issues and improve diagnostic capacity.

In summary, this study reinforces previous literature advocating MRI's superiority over clinical examination in tumor size estimation for cervical carcinoma. These findings underscore the need for integrating imaging modalities into routine clinical workflows to improve diagnostic accuracy and treatment outcomes.

Conclusion

MRI demonstrated superior accuracy compared to clinical examination in estimating tumor size in early-stage cervical carcinoma. It showed a stronger correlation with histopathological tumor size and greater consistency across tumor size categories. These findings support MRI's integration into standard staging protocols to improve preoperative assessment and individualized treatment planning.

Acknowledgment

I would like to express my sincere gratitude for the invaluable support and cooperation provided by the staff, participants, and my co-authors/colleagues who contributed to this study.

Conflicts of interest

There are no conflicts of interest.

Ethical approval

The study was approved by the Institutional Ethics Committee.

References

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries: Global cancer statistics. CA Cancer J Clin. 2018;68(6):394-424.
2. Kumari A, Paga A. Comparative study of MRI staging vs Figo staging of carcinoma cervix. International Journal of Contemporary Medical Research. 2017;4(5):1196-8.
3. Bhatla N, Berek JS, Cuello Fredes M, Denny LA, Grenman S, Karunaratne K, Kehoe ST, Konishi I, Olawaiye AB, Prat J, Sankaranarayanan R. Revised FIGO staging for carcinoma of the cervix uteri. International Journal of Gynecology & Obstetrics. 2019 Apr;145(1):129-35.
4. Rubens D, Thornbury JR, Angel C, Stoler MH, Weiss SL, Lerner RM, Beecham J. Stage IB cervical carcinoma: comparison of clinical, MR, and pathologic staging. American Journal of Roentgenology. 1988 Jan 1;150(1):135-8.
5. Hricak H, Powell CB, Yu KK, Washington E, Subak LL, Stern JL, Cisternas MG, Arenson RL. Invasive cervical carcinoma: role of MR imaging in pretreatment work-up--cost minimization and diagnostic efficacy analysis. Radiology. 1996 Feb;198(2):403-9.
6. Mitchell DG, Snyder B, Coakley F, Reinhold C, Thomas G, Amendola MA, Schwartz LH, Woodward P, Pannu H, Atri M, Hricak H. Early invasive cervical cancer: MRI and CT predictors of lymphatic metastases in the ACRIN 6651/GOG 183 intergroup study. Gynecologic oncology. 2009 Jan 1;112(1):95-103.
7. Sozzi G, Berretta R, Fiengo S, Ferreri M, Giallombardo V, Finazzo F, Messana D, Capozzi VA, Colacurci N, Scambia G, Chiantera V. Integrated pre-surgical diagnostic algorithm to define extent of disease in cervical cancer. International Journal of Gynecological Cancer. 2020 Jan 1;30(1):16-20.
8. Balleyguier C, Sala E, Da Cunha T, Bergman A, Brkljacic B, Danza F, Forstner R, Hamm B, Kubik-Huch R, Lopez C, Manfredi R. Staging of uterine cervical cancer with MRI: guidelines of the European Society of Urogenital Radiology. European radiology. 2011 May;21(5):1102-10.
9. Bourgioti C, Chatoupis K, Moulopoulos LA. Current imaging strategies for the evaluation of uterine cervical cancer. World journal of radiology. 2016 Apr 28;8(4):342.
10. Lee YK, Han SS, Kim JW, Park NH, Song YS, Kang SB. Value of pelvic examination and imaging modality for the evaluation of tumor size in cervical cancer. Journal of gynecologic oncology. 2008 Jun 1;19(2):108-12.
11. Unni N, MN B TS, Puthussery PV. Diagnostic Accuracy in Staging of Carcinoma Cervix Using Magnetic Resonance Imaging versus

Clinical Staging. Journal of medical science and clinical research. 2019 Jun;7(6):371-6.

12. Nicolet V, Carignan L, Bourdon F, Prosmanne O. MR imaging of cervical carcinoma: a practical staging approach. Radiographics. 2000 Nov;20(6):1539-49.
13. Hori M, Kim T, Murakami T, Imaoka I, Onishi H, Tomoda K, Tsutsui T, Enomoto T, Kimura T, Nakamura H. Uterine cervical carcinoma: preoperative staging with 3.0-T MR imaging—comparison with 1.5-T MR imaging. Radiology. 2009 Apr;251(1):96-104.
14. Bleker SM, Bipat S, Spijkerboer AM, van der Velden J, Stoker J, Kenter GG. The negative predictive value of clinical examination with or without anesthesia versus magnetic resonance imaging for parametrial infiltration in cervical cancer stages IB1 to IIA. International Journal of Gynecological Cancer. 2013 Jan 1;23(1):193-8.
15. Sauer J, Simonds HM, Van der Merwe H, Hattingh SM. A retrospective analysis comparing clinical staging with magnetic resonance imaging staging in patients with cervical cancer. Southern African Journal of Gynecological Oncology. 2013 Jan 1;5(1):11-5.