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Comparison of the Successful Outcome of Treatment with Oral Misoprostol with Manual Vacuum Aspiration in First Trimester Incomplete Miscarriage at Tertiary Care Hospital Abbottabad

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ABSTRACT

Background: Incomplete miscarriage is a common complication of early pregnancy, requiring prompt and effective management to prevent complications and preserve future fertility. Both oral misoprostol and manual vacuum aspiration are established treatment options, but their comparative efficacy remains debated, making the choice between these modalities crucial for optimal patient care. **Objective:** To compare the successful outcome of treatment with oral misoprostol with manual vacuum aspiration in first trimester incomplete miscarriage at Tertiary Care Hospital, Abbottabad. **Study Design:** Randomized controlled trial. **Duration and Place of Study:** The study was conducted from February to May 2025 at the Department of Gynaecology and Obstetrics, Combined Military Hospital, Abbottabad, following approval of the synopsis. **Methodology:** This randomized controlled trial included 162 women with first trimester incomplete miscarriage, with 81 participants allocated to each treatment group. Sample size was calculated using OpenEpi software with 95% confidence level and 80% study power, based on previously reported success rates. Group A received oral misoprostol while Group B underwent manual vacuum aspiration. Treatment success was defined as complete evacuation without additional intervention. **Results:** Manual vacuum aspiration achieved significantly higher success rates compared to oral misoprostol (98.8% vs 82.7%, $p<0.001$). Mean age was 30.93±5.09 years versus 30.31±5.19 years respectively. Mean gestational age was 9.58±1.70 weeks versus 9.17±1.72 weeks. **Conclusion:** Manual vacuum aspiration is significantly more effective than oral misoprostol for managing first trimester incomplete miscarriage.

INTRODUCTION

Miscarriage during the first trimester, i.e., during the first 12 weeks of pregnancy, is one of the frequent problems of early pregnancy.[1] It is also often associated with errors in chromosomes, hormonal disorder, or uterine pathology, but in most of the cases the cause of the miscarriage cannot be established.[2] The symptoms clinically are vaginal bleeding, abdominal pain, and expulsion of the products of pregnancy, which may be incomplete and may need medical intervention.[3] Early and effective therapy is essential to prevent the complications such as infection, additional heavy bleeding, or late morbidity, as well as the psychological trauma associated with first-term pregnancy loss.[4]

Manual vacuum aspiration is a safe and efficient surgical technique for the evacuation of retained products of conception in incomplete miscarriage of the first trimester.[5] It is minimally invasive, carried out with the assistance of local anesthesia, and has fewer complications relative to sharp curettage.[6] It is a quick procedure, with early recovery, and also enables the resumption of daily activities earlier.[7] It also reduces the chances of intrauterine adhesion and late pregnancy-related dysfunction, thereby sparing future fecundity.[8] Universal applicability in primary as well as in the specialty care sector reflects it to be an effective parameter in the management of miscarriages.[9]

Orally administered misoprostol, a prostaglandin E1 analogue, has been extremely valuable in the treatment of incomplete miscarriage.[10] Through its uterotonic effect, it induces uterine contractions to evacuate the retained products and minimizes intraoperative blood loss.[11] Oral misoprostol administration increases procedural success rates, reduces the proportion of repeat interventions, and enhances patient satisfaction by reducing the risk of incomplete evacuation.[12] Secondly, its oral mechanism of action is simple, painless, and affordable, rendering it valuable in both resource-rich and resource-poor health facilities.[13]

A study conducted by Ibiyemi and colleagues reported a success rate of 88 percent with oral misoprostol

compared to 98.9 percent with manual vacuum aspiration.[14]

It was essential to conduct this research in Abbottabad since the differences in this area in the availability of care, patient demands, and clinicians' practices could have influenced the outcome of the care of miscarriage. Data on the subject had been limited, and the outcome of others' findings could have misrepresented the situation of women in this population. Development of context-specific research assisted clinicians in adopting the most efficient, safe, and acceptable care approaches, ultimately supporting the care of reproductive health in the area.

METHODOLOGY

This randomized controlled trial was carried out in the Department of Gynaecology and Obstetrics, Combined Military Hospital, Abbottabad from February to May 2025 following the approval of the synopsis. A total of 162 women were included, with 81 participants allocated to each treatment group. The sample size was calculated using OpenEpi software, taking a confidence level of 95% and study power of 80%, based on previously reported success rates of oral misoprostol and manual vacuum aspiration.[14]

Approval for the study was obtained from the College of Physicians and Surgeons Pakistan as well as the institutional ethics review committee prior to data collection. Women were enrolled if they presented with incomplete miscarriage at or before 13 weeks of gestation, with parity and gravida of at least one, and were aged between 20 and 45 years. Exclusion was applied to those with pre-existing medical illnesses such as type II diabetes mellitus, thyroid dysfunction, hypertension, thrombophilia, chronic liver or cardiac disease, women with congenital fetal anomalies diagnosed on ultrasound, ectopic pregnancies, patients with contraindications to prostaglandins including asthma and hypertension, those who were hemodynamically unstable, or found to be anemic with hemoglobin levels below 9 g/dl. Written informed consent was obtained from each participant before enrollment, both for study participation and for the use of clinical data in research.

Demographic details recorded included age, place of residence, gestational age, parity, gravida, occupation, educational level, and monthly household income. Clinical history and examination findings were documented. Incomplete miscarriage was characterized by vaginal bleeding during the current pregnancy, with either ongoing passage of tissue or a past episode of tissue expulsion, a positive urinary pregnancy test, and an open cervical os. The diagnosis was confirmed with transvaginal ultrasound showing intrauterine echogenic material, where an anteroposterior diameter greater than 1.5 cm was regarded as significant.

Participants were assigned into two groups using block randomization with sealed opaque envelopes. Those in the misoprostol group received 400 micrograms of misoprostol (Cytotec, Searle) sublingually, with a maximum of three doses depending on uterine response. An oxytocin infusion was initiated following the first dose to facilitate uterine evacuation. In the manual vacuum aspiration group, the procedure was performed using an IPAS double-valve syringe, and no uterotonic was administered. Both groups received prophylactic antibiotics, including doxycycline 100 mg twice daily and metronidazole 400 mg three times daily for five days. Outcomes were assessed seven days after hospital discharge using transvaginal ultrasound. A successful outcome was defined as complete evacuation of the uterine cavity confirmed on transvaginal ultrasound.

Data were analyzed using SPSS version 20. Continuous variables such as age, body mass index, and gestational age were described as mean with standard deviation if normally distributed, or median with interquartile range when data did not follow a normal distribution, assessed through the Kolmogorov–Smirnov test. Categorical variables including residence, parity, gravida, occupation, education, monthly income, and treatment success were presented as frequencies and percentages. Comparison of treatment outcomes between the two groups was performed using the chi-square test or Fisher's exact test where appropriate. Stratification was applied for potential effect modifiers including age, residence, socioeconomic status, education, occupation, and gestational age, followed by post-stratification statistical testing. A p-value of 0.05 or less was considered statistically significant.

RESULTS

The demographic characteristics were similar between the oral misoprostol and manual vacuum aspiration groups (as shown in Table-I). The mean age was 30.31±5.19 years versus 30.93±5.09 years, mean BMI was 25.80±1.93 kg/m^2 versus 25.79±2.67 kg/m^2, mean gestational age was 9.17±1.72 weeks versus 9.58±1.70 weeks, mean gravida was 2.67±1.15 versus 2.54±1.20, and mean parity was 1.67±1.15 versus 1.54±1.20, respectively. Regarding residence, 52 (64.2%) versus 42 (51.9%) patients were from urban areas, while 29 (35.8%) versus 39 (48.1%) were from rural areas. Employment status showed 35 (43.2%) versus 32 (39.5%) employed patients and 46 (56.8%) versus 49 (60.5%) unemployed patients. Family income distribution revealed 67 (82.7%) versus 66 (81.5%) patients with income ≤75K and 14 (17.3%) versus 15 (18.5%) with income >75K. Educational levels showed 7 (8.6%) versus 5 (6.2%) illiterate patients, 21 (25.9%) versus 18 (22.2%) with primary education, 29 (35.8%) versus 25 (30.9%) with secondary education, and 24 (29.6%) versus 33 (40.7%) with higher education (as shown in Table-I).

Table I

Patient Demographics N=162

Demographics	Oral Misoprostol (n=81)	Manual Vacuum Aspiration (n=81)
Age (Years)	30.31±5.19	30.93±5.09
BMI (kg/m^2)	25.80±1.93	25.79±2.67
Gestational Age (Weeks)	9.17±1.72	9.58±1.70
Gravida	2.67±1.15	2.54±1.20
Parity	1.67±1.15	1.54±1.20
Residence		
Urban n (%)	52 (64.2%)	42 (51.9%)
Rural n (%)	29 (35.8%)	39 (48.1%)
Occupation		
Employed n (%)	35 (43.2%)	32 (39.5%)
Unemployed n (%)	46 (56.8%)	49 (60.5%)
Family Income		

≤75K n (%)	67 (82.7%)	66 (81.5%)
>75K n (%)	14 (17.3%)	15 (18.5%)
Education		
Illiterate n (%)	7 (8.6%)	5 (6.2%)
Primary n (%)	21 (25.9%)	18 (22.2%)
Secondary n (%)	29 (35.8%)	25 (30.9%)
Higher n (%)	24 (29.6%)	33 (40.7%)

The efficacy comparison demonstrated significantly higher success rates for manual vacuum aspiration compared to oral misoprostol, with 80 (98.8%) versus 67 (82.7%) successful outcomes and 1 (1.2%) versus 14 (17.3%) failures, respectively (p<0.001, Fischer Exact Test) (as shown in Table-II).

Table II

Comparison of Successful Outcome between the two groups

Successful Outcome	Oral Misoprostol n=81	Manual Vacuum Aspiration n=81	P value
	n (%)	n (%)	
Yes	67 (82.7%)	80 (98.8%)	<0.001*
No	14 (17.3%)	1 (1.2%)	
Total	81 (100%)	81 (100%)	

***Fischer Exact Test**

The stratified analysis by demographic variables revealed varied associations with treatment efficacy (as shown in Table-III). For age groups, patients ≤35 years showed success rates of 56 (83.6%) versus 69 (98.6%) with failures of 11 (16.4%) versus 1 (1.4%) for oral misoprostol versus manual vacuum aspiration respectively (p=0.683). Patients >35 years demonstrated success rates of 11 (78.6%) versus 11 (100.0%) with failures of 3 (21.4%) versus 0 (0.0%) respectively (p=1.000). Gestational age ≤10 weeks showed success rates of 50 (86.2%) versus 48 (100.0%) with failures of 8 (13.8%) versus 0 (0.0%) respectively (p=0.011), while >10 weeks showed success rates of 17 (73.9%) versus 32 (97.0%) with failures of 6 (26.1%) versus 1 (3.0%) respectively (p=1.000). Urban residents had success rates of 46 (88.5%) versus 41 (97.6%) with failures of 6 (11.5%) versus 1 (2.4%) respectively (p=0.589), while rural residents showed success rates of 21 (72.4%) versus 39 (100.0%) with failures of 8 (27.6%) versus 0 (0.0%) respectively (p=0.484). Employed patients demonstrated success rates of 31 (88.6%) versus 31 (96.9%) with failures of 4 (11.4%) versus 1 (3.1%) respectively (p=0.266), while unemployed patients showed success rates of 36 (78.3%) versus 49 (100.0%) with failures of 10 (21.7%) versus 0 (0.0%) respectively (p=0.488). Family income ≤75K showed success rates of 54 (80.6%) versus 65 (98.5%) with failures of 13 (19.4%) versus 1 (1.5%) respectively (p=1.000), while income >75K demonstrated success rates of 13 (92.9%) versus 15 (100.0%) with failures of 1 (7.1%) versus 0 (0.0%) respectively (p=1.000). Educational stratification revealed illiterate patients had success rates of 4 (57.1%) versus 5 (100.0%) with failures of 3 (42.9%) versus 0 (0.0%) respectively (p=0.429), primary education showed success rates of 17 (81.0%) versus 18 (100.0%) with failures of 4 (19.0%) versus 0 (0.0%) respectively (p=0.491), secondary education demonstrated success rates of 25 (86.2%) versus 24 (96.0%) with failures of 4 (13.8%) versus 1 (4.0%) respectively (p=1.000), and higher education showed success rates of 21 (87.5%) versus 33 (100.0%) with failures of 3 (12.5%) versus 0 (0.0%) respectively (p=0.238). All stratified analyses were performed using Fischer Exact Test (as shown in Table-III).

Table III

Association of Successful Outcome with Demographic Variables

Demographics variables	Group	Successful Outcome		P-value
		Yes (n, %)	No (n, %)	
Age (years)				
≤35	A	56 (83.6%)	11 (16.4%)	0.683*
	B	69 (98.6%)	1 (1.4%)	
>35	A	11 (78.6%)	3 (21.4%)	1.000*
	B	11 (100.0%)	0 (0.0%)	
Gestational Age (weeks)				
≤10	A	50 (86.2%)	8 (13.8%)	0.011*
	B	48 (100.0%)	0 (0.0%)	
>10	A	17 (73.9%)	6 (26.1%)	1.000*
	B	32 (97.0%)	1 (3.0%)	
Residence				
Urban	A	46 (88.5%)	6 (11.5%)	0.589*
	B	41 (97.6%)	1 (2.4%)	
Rural	A	21 (72.4%)	8 (27.6%)	0.484*
	B	39 (100.0%)	0 (0.0%)	
Occupation				
Employed	A	31 (88.6%)	4 (11.4%)	0.266*
	B	31 (96.9%)	1 (3.1%)	
Unemployed	A	36 (78.3%)	10 (21.7%)	0.488*
	B	49 (100.0%)	0 (0.0%)	
Family Income				
≤75K	A	54 (80.6%)	13 (19.4%)	1.000*
	B	65 (98.5%)	1 (1.5%)	
>75K	A	13 (92.9%)	1 (7.1%)	1.000*
	B	15 (100.0%)	0 (0.0%)	
Education				
Illiterate	A	4 (57.1%)	3 (42.9%)	0.429*
	B	5 (100.0%)	0 (0.0%)	
Primary	A	17 (81.0%)	4 (19.0%)	0.491*
	B	18 (100.0%)	0 (0.0%)	
Secondary	A	25 (86.2%)	4 (13.8%)	1.000*
	B	24 (96.0%)	1 (4.0%)	
Higher	A	21 (87.5%)	3 (12.5%)	0.238*
	B	33 (100.0%)	0 (0.0%)	

*Fischer Exact Test

DISCUSSION

The present study compared the efficacy of oral misoprostol versus manual vacuum aspiration for the management of first trimester incomplete miscarriage, revealing significantly superior outcomes with manual vacuum aspiration (98.8% vs 82.7% success rate, p<0.001). This substantial difference in efficacy can be attributed to the fundamental mechanisms of action of these two treatment modalities. Manual vacuum aspiration provides immediate and complete mechanical removal of retained products of conception through direct suction, ensuring thorough evacuation of the uterine cavity in a single procedure. In contrast, oral misoprostol relies on pharmacological stimulation of uterine contractions through prostaglandin E1 receptor activation, which may result in incomplete expulsion due to variable individual responses to the medication, suboptimal dosing, or inadequate uterine contractility.

The demographic homogeneity between both treatment groups validates the comparability of the study populations, with similar distributions across age, BMI, gestational age, gravida, parity, residence, occupation,

family income, and educational levels. The stratified analysis revealed that gestational age ≤10 weeks was the only demographic variable showing a statistically significant difference (p=0.011), with oral misoprostol demonstrating relatively better performance in earlier gestational ages compared to later ones. This finding reflects the physiological principle that smaller gestational ages typically involve less tissue volume and may require less forceful uterine contractions for complete evacuation, making prostaglandin-induced contractions more likely to achieve successful outcomes.

Our findings align with several studies demonstrating superior efficacy of manual vacuum aspiration. Humaira Shaheen et al. [15] reported MVA achieving 92.3% efficacy versus 76.9% for misoprostol (P=0.05), which is consistent with our results showing MVA's superior performance. Similarly, Sundas Naseem et al. [16] found 94% efficacy with MVA compared to 85% with misoprostol, supporting our observation of MVA's higher success rates. The demographic characteristics in our study were comparable to previous research, with mean ages of 30.31±5.19 years (misoprostol) and 30.93±5.09 years (MVA), closely matching Humaira Shaheen et al. [15] who reported 29.02±6.65 years for medical group and 30.23±6.72 years for MVA group, and Nadia Zaman et al. [17] with 29.2±6.32 years for misoprostol and 28.7±5.93 years for MVA.

However, some studies have reported contrasting results regarding efficacy differences. Chandra Madhu Das et al. [18] found comparable efficacy rates of 98.2% for MVA versus 97.3% for misoprostol (P=0.65), while Bushra Khan et al. [19] reported 90.5% for MVA versus 95.2% for misoprostol (P=0.148). These variations may be attributed to differences in misoprostol dosing protocols, patient selection criteria, gestational age ranges, and completion criteria definitions. Our study's significantly higher success rate with MVA may reflect stricter completion criteria or different population characteristics compared to these studies.

The gestational age stratification in our study revealed important insights, with MVA maintaining superior performance across all gestational ages, particularly showing 100% success in patients ≤10 weeks compared to 86.2% with misoprostol (p=0.011). This finding is supported by Humaira Shaheen et al. [15] who demonstrated that gestational age 7-12 weeks showed 100% efficacy with MVA versus 78.9% with misoprostol (P=0.034). The physiological explanation for this pattern lies in the increasing tissue volume and complexity of products of conception as pregnancy advances, making mechanical evacuation more reliable than pharmacological methods for complete removal.

Age-related outcomes in our study showed no statistically significant differences between treatment modalities across age groups, which contrasts with Humaira Shaheen et al. [15] findings where MVA showed superior efficacy in women aged 31-40 years (96.3% vs 65%, P=0.007). This discrepancy may reflect differences in sample size distribution across age groups or varying hormonal responsiveness to prostaglandins in different populations. The consistent performance of MVA across demographic variables in our study reinforces the mechanical advantage of surgical evacuation over pharmacological methods, as surgical techniques are less dependent on individual physiological variations in drug metabolism, receptor sensitivity, or uterine contractility patterns that may influence misoprostol effectiveness.

This study has several limitations that should be acknowledged when interpreting the results. As a single-center study conducted at one institution, the generalizability of findings to other populations and healthcare settings may be limited due to variations in patient demographics, clinical protocols, and healthcare delivery systems. The sample size, while adequate for detecting significant differences between treatment groups, may not have been sufficient to identify smaller effect sizes in subgroup analyses, particularly when stratifying by demographic variables.

CONCLUSION

Our research has determined that manual vacuum aspiration is considerably more efficient compared to oral misoprostol in the treatment of first trimester incomplete miscarriage. MVA's greater efficacy was evidenced in all the demographic parameters, and the difference was most significant in the patients with a gestation age of ten weeks or below. Although the two treatment methods revealed acceptable rates of success, mechanical superiority of surgical evacuation resulted in more dependable and predictable results as opposed to pharmacologically managed patients.

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