

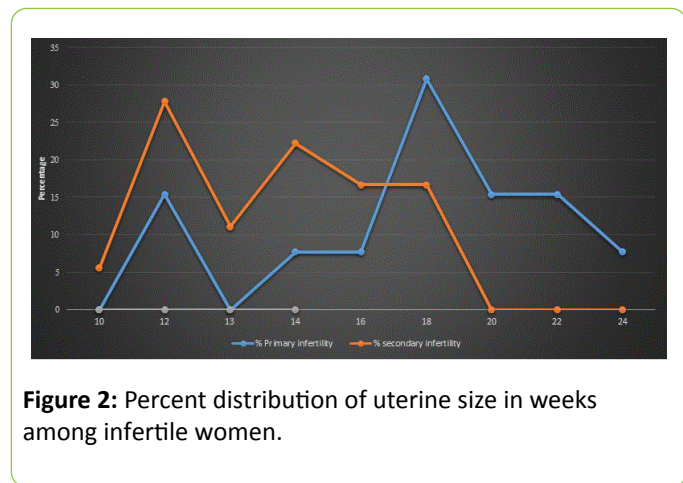








parous and only 1 (12.0%) of the 8 obese women was parous with a parity of 1. Ratio of miscarriages per woman was minimal (0.4:1) among normal weight infertile women and maximal (1.9:1) among obese women.



**Figure 2:** Percent distribution of uterine size in weeks among infertile women.

**Figure 2** shows the distribution of uterine size (weeks) among the infertile women, indicating that a higher proportion of women with secondary infertility presented with uterine size 10-16 weeks. This situation was reversed as higher proportion of women with primary infertility presented with uterine size 16-24 weeks.

**Table 3** showed that a total of 17 (54.8%) patients presented with dysmenorrhea which was more prevalent among women aged 31-35 years (63%), obese women (87%) and those with secondary infertility (56%). Menorrhagia was seen in 14 (45.2%) mostly in all (100%) women aged 26-30 years, those with normal weight (78%) and in primary infertility (54%). In all, 14 (45.2%) infertile women presented with abdominal swelling, seen more frequently among women aged 46-50 years (43%), overweight (50%) and obese (50%) patients and among those with primary infertility (54%). Dysuria, failed IVF and frank abdominal pain were rare clinical presentations.

**Table 3:** Distribution of symptomatology presented by the infertile women according to age group, BMI and type of infertility. IVF = *In Vitro* Fertilization; BMI = Body Mass Index.

	Age group (years)					BMI			Infertility	
	26-30 Freq. (%)	31-35 Freq. (%)	36-40 Freq. (%)	41-45 Freq. (%)	46-50 Freq. (%)	18.5-24.9 Freq. (%)	25.0-29.9 Freq. (%)	≥30 Freq. (%)	Primary Freq. (%)	Secondary Freq. (%)
<b>Symptoms</b>										
<b>Dysmenorrhea</b>										
Yes	2 (100)	5 (63)	6 (60.0)	3 (37.0)	1 (33.0)	6 (67.0)	4 (29)	7 (87)	7 (54)	10 (56)
No	0 (0)	3 (37)	4 (40.0)	5 (63.0)	2 (67.0)	3 (33.0)	10 (71)	1 (13)	6 (46)	8 (44)
<b>Abdominal swelling</b>										
Yes	1 (50)	3 (37)	6 (60)	2 (25)	2 (67)	3 (33)	7 (50)	4 (50)	7 (54)	7 (39)
No	1 (50)	5 (63)	4 (40)	6 (75)	1 (33)	6 (67)	7 (50)	4 (50)	6 (46)	11 (61)
<b>Abdominal pain</b>										
Yes	0 (0)	1 (13)	0 (0)	0 (0)	0 (0)	1 (11)	0 (0)	0 (0)	0 (0)	1 (6)
No	2 (100)	7 (87)	10 (100)	8 (100)	3 (100)	8 (89)	14 (100)	8 (100)	13 (100)	17 (94)
<b>Failed IVF</b>										
Yes	0 (0)	0 (0)	0 (0)	1 (13)	0 (0)	0 (0)	1 (7)	0 (0)	0 (0.0)	1 (6)
No	2 (100)	8 (100)	10 (100)	7 (87)	3 (100)	9 (100)	13 (93)	8 (100)	13 (100)	17 (94)
<b>Menorrhagia</b>										
Yes	2(100)	4 (50)	5 (50)	2 (33)	1 (33)	7 (78)	3 (21)	4 (50)	7 (54)	7 (39)
No	0 (0)	4 (50)	5 (50)	6 (67)	2 (67)	2 (22)	11 (79)	4 (50)	6 (46)	11 (61)
<b>Dysuria</b>										
Yes	0 (0)	1 (13)	0 (0)	0 (0)	0 (0)	1 (11)	0 (0)	0 (0)	1 (8)	0 (0)
No	2 (100)	7 (87)	10 (100)	8 (100)	3 (100)	8 (89)	14 (100)	8 (100)	12 (92)	18 (100)
<b>Infertility</b>										

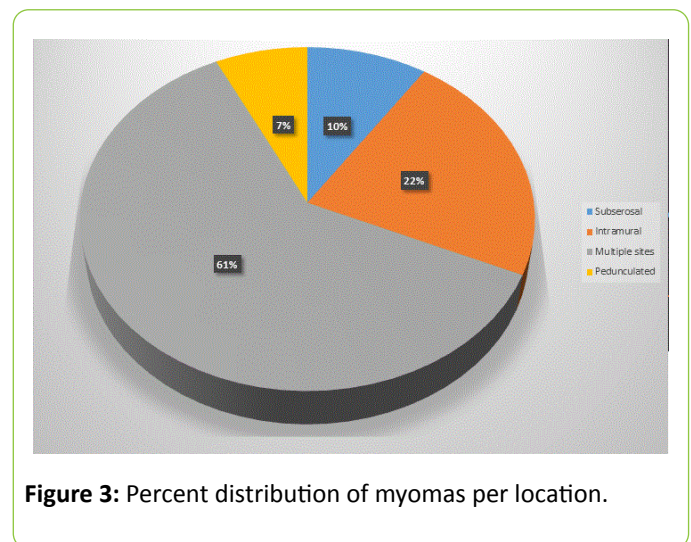
Yes	1 (50)	5 (63)	4 (67)	6 (50)	2 (67)	6 (67)	8 (57)	4 (50)	7 (54)	11 (61)
No	1 (50)	3 (37)	2 (33)	6 (50)	1 (33)	3 (33)	6 (43)	4 (50)	6 (46)	7 (39)

**Table 4:** Uterine size (weeks) by age-group (years), body mass index (BMI) and type of infertility.

	Uterine size (weeks)									Total uterine size (weeks)	Total number of women	Uterine size/woman	Mean (± sd) uterine size
	10	12	13	14	16	18	20	22	24				
All	-	-	-	-	-	-	-	-	-	488	31	15.7/1	15.7 (3.6)
Age-group	-	-	-	-	-	-	-	-	-	-	-	-	-
25-30	0	0	0	0	1	1	0	0	0	34	2	17.0/1	17.0 (1.4)
31-35	1	2	1	0	2	0	1	1	0	121	8	15.1/1	15.1 (4.2)
36-40	0	2	0	2	0	4	1	0	1	168	10	16.8/1	16.8 (3.8)
41-45	0	2	1	3	1	1	0	0	0	113	8	14.1/1	14.1 (2.0)
46-50	0	1	0	0	0	1	0	1	0	52	3	17.3/1	17.3 (5.0)
BMI	-	-	-	-	-	-	-	-	-	-	-	-	-
Normal	0	3	0	0	2	2	1	1	0	146	9	16.2/1	16.2 (3.7)
Overweight	1	2	1	4	2	3	0	1	0	211	14	15.1/1	15.1 (3.1)
Obese	0	2	1	1	0	2	1	0	1	131	9	16.4/1	16.4 (4.3)
Type of infertility	-	-	-	-	-	-	-	-	-	-	-	-	-
Primary	0	2	0	1	1	4	2	2	1	234	13	18.0/1	18.0 (3.7)
Secondary	1	5	2	4	3	3	0	0	0	254	18	14.1/1	14.1 (2.4)

**Table 4** shows that the patients’ mean (± sd) uterine size was 15.7 (3.4). Cumulative uterine size was calculated for each age group, BMI and type of infertility and a ratio of uterine size per woman were calculated. Eleven women (35.5%) had uterine size of 16-18 weeks and only 5 (16.1%) women had uterine sizes of 20 weeks and above. The highest ratio of uterine size (in weeks) per infertile woman was observed among those aged 46-50 years (17.3 per woman), among obese infertile women (16.4 per woman) and among those with primary infertility (18.0 per woman). **Figure 3** is a graphical illustration of the distribution of percent frequency distribution of myomas among the patients.

**Figure 3** is a graphical illustration of the mean number of myomas observed in each of the four identified sites where the fibroids were found. Most (15, 48.4%) infertile women had their myomas located in multiple sites, with 10 (32.26%) and 4 (12.90%) myomas solely intramural and subserosal respectively. Two (6.45%) fibroids were exclusively pedunculated.



**Figure 3:** Percent distribution of myomas per location.

**Table 5:** Frequency and percent distribution of individual myoma relative to age, body mass index and type of infertility.

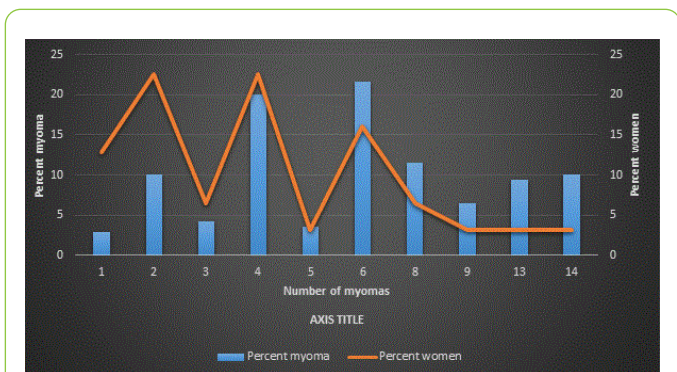
Age group (years)	Absolute number of myomas enucleated											Total (%) of myoma enucleated	Total (%) of women
	1	2	3	4	5	6	8	9	13	14			

25-30	0	1	0	1	0	0	0	0	0	0	6 (4.3)	2 (6.5)
31-35	0	2	1	3	0	1	1	0	0	0	33 (23.7)	8 (25.8)
36-40	2	1	0	2	1	2	0	1	1	0	51 (36.7)	10 (32.3)
41-45	2	3	1	0	0	2	0	0	0	0	23 (16.6)	8 (25.8)
46-50	0	0	0	1	0	0	1	0	0	1	26 (18.7)	3 (9.7)
BMI												
Normal	0	2	1	2	0	1	2	1	0	0	46 (33.1)	9 (29.0)
Overweight	3	3	1	3	1	3	0	0	0	0	47 (33.8)	14 (45.2)
Obese	1	2	0	2	0	1	0	0	1	1	46 (33.1)	8 (25.8)
Type of infertility												
Primary	1	2	0	4	0	2	2	1	1	0	71 (51.1)	13 (41.9)
Secondary	3	5	2	3	1	3	0	0	0	1	68 (48.9)	18 (58.1)

**Table 5** shows that 6 seedlings were the most frequent number of fibroid seedlings removed from 5 (16.1%) individual patients, contributing 30 (21.6%) of the total number of fibroids enucleated. This was followed by 4 seedlings removed from 7 (22.6%) individual patients contributing 28 (20.1%) of the enucleated fibroids. The largest number of seedlings removed from a patient was 14 (**Figure 4**).

mostly (47, 33.8%) from overweight women (14, 45.2%) most (71, 51.1%) from women with primary infertility (13, 41.9%).

**Table 6** shows that multiport laparoscopy was the sole method used for all the patients, 17 (55%) using 3 ports, 9 (29%) 2 ports and 5 (16%) using 4 ports. Majority (22, 71%) used Palmer's point of entry. Overall mean ( $\pm$  sd) blood loss was 399 ( $\pm$  338) ml ranging from 60 to 1,500 mls. There was no significant difference ( $t = 1.24, p = 0.22$ ) in the immediate mean pre-op ( $34.7 \pm 3.3$ ) and post-op ( $33.6 \pm 3.7$ ) Packed Cell Volume (PCV). Only three (9.7%) patients needed blood transfusion among whom were all who had continuous interlocking closure of myoma bed, two who individually presented with four myomas and one who presented with thirteen myomas; two who presented with uterine size 16 weeks and 1 with uterine size 24 weeks. In all, 7(23.0%) patients developed post-op complications. Complications included one hematoma collection and one excessive hemorrhage of about 1.5 ltrs warranting open laparotomy. The remaining five patients presented with pyrexia that resolved with the administration of simple analgesics. There were no anesthetic complications. There was no evidence of association between previous abdominal surgeries, previous induced abortion, body mass index and the rate of complications.



**Figure 4:** Percent frequency distribution of myomas among women after laparoscopic myomectomy.

Overall, 139 myomas were enucleated from 31 patients, mostly (51, 36.7%) from those aged 36-40 years (10, 32.3%),

**Table 6:** Management of operational procedures. PCV = Packed Cell Volume; SF = Stratafix; ED = Electrodiathermy; CIL = Continuous Interlocking; CIC = Continuous Intracorporeal.

	Use of Palmer point		No. of accessory ports used			Pre-operation complication		Intra-operation complication		Convert to Laparotomy		Excess blood loss Mean ( $\pm$ sd)	Pre-op PCV Mean ( $\pm$ sd)	Post-op PCV Mean ( $\pm$ sd)	Closure of myoma bed				
	Yes Freq. (%)	No Freq. (%)	2 Freq. (%)	3 Freq. (%)	4 Freq. (%)	Yes Freq. (%)	No Freq. (%)	Yes Freq. (%)	No Freq. (%)	Yes Freq. (%)	No Freq. (%)				SF Freq. (%)	ED Freq. (%)	CIL Freq. (%)	CIC Freq. (%)	

All Freq. (%)	22 (71)	9 (29)	9 (29)	17 (55)	5 (16)	1 (5)	30 (97)	4 (13)	27 (87)	1 (3)	30 (97)	399 (338)	34.7 (3.3)	33.6 (3.7)	6 (19)	1 (3)	20 (65)	4 (13)
Age group																		
25-30	1 (5)	1 (11)	2 (22)	0 (0)	0 (0)	0 (0)	2 (7)	0 (0)	2 (7)	0 (0)	2 (7)	225.0 (35.4)	32.0 (5.7)	31.5 (6.4)	1 (17)	0 (0)	1 (5)	0 (0)
31-35	5 (23)	3 (33)	2 (22)	5 (29)	1 (20)	1 (100)	7 (23)	1 (25)	7 (26)	0 (0)	8 (27)	312.5 (208.3)	34.5 (4.0)	33.5 (3.8)	1 (17)	1 (100)	6 (30)	0 (0)
36-40	5 (23)	5 (56)	4 (44)	6 (35)	0 (0)	0 (0)	10 (33)	3 (75)	7 (26)	1 (100)	9 (30)	501.0 (488.9)	35.1 (3.5)	33.7 (4.7)	1 (17)	0 (0)	9 (45)	0 (0)
41-45	8 (36)	0 (0)	0 (0)	4 (23)	4 (80)	0 (0)	8 (27)	0 (0)	8 (30)	0 (0)	8 (27)	375.0 (291.5)	34.5 (2.3)	33.7 (2.4)	2 (33)	0 (0)	3 (15)	3 (75)
46-50	3 (14)	0 (0)	1 (11)	2 (12)	0 (0)	0 (0)	3 (10)	0 (0)	3 (11)	0 (0)	3 (11)	466.7 (251.7)	36.7 (1.5)	35.2 (1.3)	1 (17)	0 (0)	1 (5)	1 (25)
BMI																		
Normal	7 (32)	2 (22)	2 (22)	6 (35)	1 (20)	0 (0)	9 (30)	1 (25)	8 (30)	0 (0)	9 (30)	312.2 (242.1)	34.1 (4.2)	33.0 (4.2)	2 (33)	0 (0)	6 (30)	1 (25)
Over-Weight	10 (45)	4 (44)	5 (56)	6 (35)	3 (60)	1 (100)	13 (43)	1 (25)	13 (48)	0 (0)	14 (47)	371.4 (286.0)	34.8 (3.0)	33.9 (2.9)	3 (50)	1 (100)	8 (40)	2 (50)
Obese	5 (23)	3 (33)	2 (22)	5 (29)	1 (20)	0 (0)	8 (27)	2 (50)	6 (22)	1 (100)	7 (23)	543.8 (484.4)	35.4 (3.1)	34.0 (4.5)	1 (17)	0 (0)	6 (30)	1 (25)
Type of infertility																		
Primary	8 (36)	5 (56)	5 (56)	8 (47)	0 (0)	0 (0)	13 (43)	4 (100)	9 (33)	1 (100)	12 (40)	496.9 (444.7)	34.0 (4.0)	32.4(4.6)	3 (50)	0 (0)	9 (45)	1 (25)
Secondary	14(64)	4 (44)	4 (44)	9 (53)	5 (100)	1(100)	17 (57)	0 (0)	18 (67)	0 (0)	18 (60)	327.8 (221.1)	35.3 (2.7)	34.5 (2.6)	3 (50)	1 (100)	11 (55)	3 (75)

Conversion to laparotomy occurred in 1 (3.2%) out of LM performed. Closure of myoma bed was mostly single layer closure (20, 65%). Nine (11%) had multi-layer closure and electro diathermy was used in 1 (3%) of the patients. All fibroids were retrieved by morcellation (139 or 100%).

The mean (± sd) length of hospital stay was 2.77 (2.9) days ranging from 2 to 9 days. As illustrated in **Figure 5 and Table 7**.

14 (45.2%) patients had a hospital stay of 2 days' duration and another 11 (35.5%) for 3 days' duration. Twenty-seven (87%) of the patients had no co-morbidities while four (13%) did have, among whom were two with adenomyosis, one with endometriotic deposits and another with adenomyosis and endometriosis.

After having hysteroscopy 8 weeks post LM to check the integrity of the uterine cavity, 15 out of the 31 women went ahead with in-vitro fertilization treatment. Three (20%) of them had live births, 2 with single live births (male and female) and one with twin live birth.

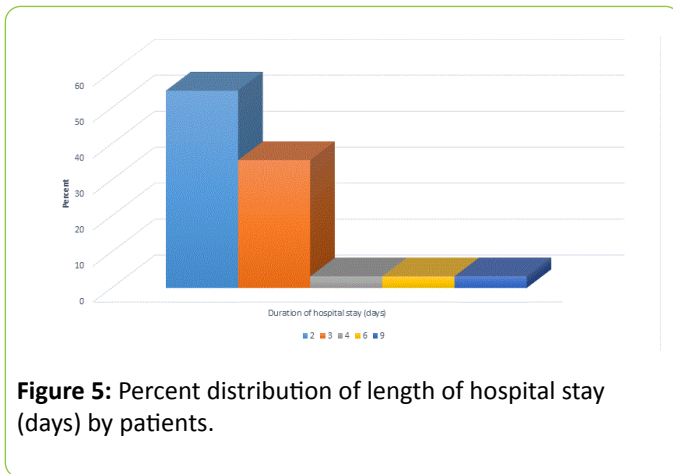
## Discussion

Women with primary infertility were more likely to have larger uterine sizes due to fibroids. Even though the debate continues if fibroids are linked to infertility [29, 30]. Majority of the women had secondary infertility and were overweight. Dysmenorrhea and menorrhagia followed by abdominal swelling were the common presentations or symptoms in that



order. The fibroids were more likely to be in multiple sites. Intramural fibroids were commoner.

The most seedlings were retrieved from women who were overweight and had primary infertility. It is noteworthy that multiple port approach was the main method used and palmer's point was the point of entry in most of the cases. The complication rate was 26% even though included in this was a case of reaction to blood transfusion. Others included pelvic infection and one hematoma formation. The conversion rate from laparoscopy to laparotomy was 3.2% [1] and it was in the case of a 93.4 kg woman who had a 24-week size uterine mass and 13 fibroids seedlings were retrieved from her. She lost 1500 ml of blood. The conversion rate in this study was similar to 3.4% reported in another study [31] but lower than the 11.3% reported in another study which found the main risk of conversion to be size of myoma, anterior location, intramural fibroids and use of Gonadotropin-releasing hormone (GnRH) agonist pre-operatively [32].



**Figure 5:** Percent distribution of length of hospital stay (days) by patients.

**Table 7:** Mean length of hospital stay, outcome of pregnancy and postop management.

	Length of hospital stay (days)	Comorbidity		Post-operation blood transfusion		Pregnancy outcome				Post-operation complication		
		Mean (± sd)	Yes Freq. (%)	No Freq. (%)	Yes Freq. (%)	No Freq. (%)	No treatment Freq. (%)	Positive Freq. (%)	Negative Freq. (%)	Treatment not started yet Freq. (%)	Yes Freq. (%)	No Freq. (%)
All	2.77 (1.43)	4 (13)	27 (87)	3 (9.7)	28 (90)	16 (52)	11 (35)	3 (10)	1 (3)	7 (23)	24 (77)	
Age group												
25-30	2.0 (0.0)	0 (0)	2 (7)	0 (0)	2 (7)	2 (13)	0 (0)	0 (0)	0 (0)	1 (14)	1 (4)	
31-35	2.5 (0.5)	1 (33)	7 (26)	1 (33)	7 (25)	3 (19)	4 (36)	1 (33)	0 (0)	1 (14)	7 (29)	
36-40	3.6 (2.3)	1 (33)	9 (33)	2 (67)	8 (28.5)	6 (37)	4 (36)	0 (0)	0 (0)	5 (71)	5 (21)	
41-45	2.4 (0.5)	1 (33)	6 (22)	0 (0)	8 (28.5)	3 (19)	3 (27)	1 (33)	1 (100)	0 (0)	8 (33)	
46-50	2.3 (0.6)	0 (0)	3 (11)	0 (0)	3 (11)	2 (12)	0 (0)	1 (33)	0 (0)	0 (0)	3 (13)	
BMI												
Normal	2.6 (0.5)	0 (0)	9 (33)	0 (0)	9 (32)	7 (44)	1 (9)	1 (33)	0 (0)	3 (43)	6 (25)	
Overweight	2.7 (1.1)	3 (75)	11 (41)	2 (67)	12 (43)	5 (31)	7 (64)	1 (33)	1 (100)	2 (29)	12 (50)	
Obese	3.1 (2.5)	1 (25)	7 (26)	1 (33)	7 (25)	4 (25)	3 (27)	1 (33)	0 (0)	2 (29)	6 (25)	
Type of infertility												
Primary	3.1 (2.1)	0 (0)	13 (48)	2 (67)	11 (39)	10 (63)	2 (18)	1 (33)	0 (0)	6 (86)	7 (29)	
Secondary	2.5 (0.6)	4 (100)	14 (52)	1 (33)	17 (61)	6 (37)	9 (82)	2 (67)	1 (100)	1 (14)	17 (71)	

It is important to take myoma size, location and number into consideration to prevent complications needing conversion to open procedure. Three of the 15 women who proceeded to have IVF had live babies delivered by elective caesarean section. This was lower than the 37.9% reported in another study among women who had assisted reproduction post

laparoscopic myomectomy [31]. It is important to consider the possibility of other factors affecting outcome of assisted conception. There were no reported uterine ruptures. Similar post laparoscopic myomectomy births with no rupture have been reported in both prospective [33] and retrospective [34] studies. However, caution must be taken in opting for vaginal

births especially in cases where the cavity was entered into. Currently, no clear guidelines exist regarding the choice of mode of delivery after myomectomy [31]. The mean blood loss was 442 mls and there was significant difference in mean preoperative and post-operative packed cell volume though only four women needed transfusion. This may be due to the fact that majority of the patients had multiple fibroids. The mean hospital stay was short. This is one of the benefits of laparoscopic myomectomy. A recent meta-analysis showed that laparoscopic myomectomy achieved lower blood loss, post-operative pain and overall complications compared to open myomectomy however operation time was increased in the laparoscopic myomectomy group [35, 36].

## Conclusion

Laparoscopic myomectomy can be regarded as a safe and beneficial alternative to open myomectomy. However, importance of endoscopic training and proper selection of patients especially in developing countries cannot be overemphasized. A total of 139 fibroids were removed from 31 infertile women before undergoing IVF. These fibroids were more in multiple sites. Multiport laparoscopy was the sole method used for myomectomy among the patients. Overall mean blood loss was 399 mls and only 3 patients required blood transfusion. The mean length of hospital stay was 2.77 days and 27 of the patients had no co-morbidities. In all 15 of the 31 infertile women completed IVF treatment among whom 3 gave birth to live babies. It can be concluded that laparoscopic myomectomy, when performed by an experienced surgeon, can be considered a safe technique with an extremely low failure rate and good results in terms of pregnancy outcome.

## Recommendation

For women who wish to preserve their uterus after removal of fibroid, myomectomy is a recommended option, though such women need to be counselled on not only the procedure itself but also on the risk of requiring further intervention. The surgeon should consider myomectomy during hysteroscopy as first-line conventional surgical remedy for the management of symptomatic intra-uterine fibroids. The importance of carefully monitor intra-operational fluid balance during removal of fibroids at hysteroscopy, is suggested.

## Conflicting of Interest

The authors declare no conflicting interest

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