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Research Article

Assessing The Safety of Laparoscopic Surgery in Treating of Adenocarcinoma Endometrial Cancer

Dr. Kumud Kumari[1], Dr. Nidhi Jha[2], Dr. Narendranath.S[3], Dr. John Abraham[4], Dr. Ramesh Vasudevan[5] and Dr. C. Srilakshmi[6*]

[1]*Department of Psychology, M. L. S. M. College, Darbhanga, (Lalit Narayan Mithila University, Darbhanga, Bihar)*

[2] *Post Graduate Department of Chemistry, C. M. Science College, Darbhanga (L. N. Mithila University, Darbhanga, Bihar)*

[3]*Professor of Pharmacology, JJM Medical college, Davangere, Karnataka*

[4] *Assistant Professor (Cancer Research) Department of Family Medicine St. Johns National Academy of Health Sciences, Bangalore, India- 560034*

[5]*Associate Professor Department of Surgery Apollo Institute of Medical Science Jubilee hills Hyderabad Kaloji Narayana Rao University of health sciences Telangana India*

[6*]*Zonal medical officer Adyar urban community health center Adyar zone Medical services department Greater, Chennai.*

Abstract: In recent years, there has been a growing preference for laparoscopic surgery. Insufficient data exists on the safety of laparoscopy in endometrial cancer. The objective of this study was to assess and compare the perioperative and oncologic results of laparoscopic and laparotomic. staging surgery in patients diagnosed with adenocarcinoma endometrial cancer. The study aimed to evaluate the safety and effectiveness of laparoscopic surgery in this specific patient group. A retrospective analysis was conducted on the data of 250 patients who had surgical staging for adenocarcinoma endometrial cancer at the gynecologic oncology department of a government hospital from 2018 to 2023. A comparison was made between the laparoscopy and laparotomy groups in terms of demographic, histopathologic, perioperative, and oncologic parameters. An additional assessment was conducted on a subset of individuals who had a body mass index greater than 30. The demographic and histopathologic parameters of the two groups were comparable, however laparoscopic surgery demonstrated a much higher level of effectiveness in terms of perioperative outcomes. The laparotomy group had a much greater number of excised and metastatic lymph nodes. However, this difference did not have an impact on the oncologic outcomes, such as recurrence and survival rates. Both groups had similar results in this regard. The results of the subgroup with a BMI more than 30 were consistent with those of the entire population. The intraoperative problems encountered during the laparoscopic procedure were effectively resolved. Laparoscopic surgery is considered superior to laparotomy and, depending on the surgeon's expertise, it can be safely used for surgical staging of adenocarcinoma endometrial cancer.

Keywords: Adenocarcinoma, laparoscopy, Endometrial cancer, surgical staging, laparotomy, lymphadenectomy

***Corresponding Author**

Srilakshmi , Zonal medical officer Adyar urban community health center Adyar zone Medical services department Greater, Chennai.

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1. INTRODUCTION

Endometrial cancer is the prevalent gynecologic malignancy in affluent nations. To minimize intraoperative and postoperative complications, it is crucial to focus on reducing these difficulties in older, obese patients with extensive comorbidities, since they make up the majority of cases[1]. Laparoscopic surgery has gained popularity in recent years due to its superior perioperative outcomes and quicker postoperative recovery compared to traditional open surgery. Multiple studies have indicated that laparoscopy (LS) is a secure and effective treatment for treating endometrial cancer[2]. It has been found to have comparable disease-free survival (DFS) and overall survival (OS) rates when compared to laparotomy (LT)[3]. While the safety of laparoscopic surgery has been skeptical following the LACC (Laparoscopic Approach to Cervical Cancer) study in relation to cervical cancer, there is currently insufficient evidence to determine its impact on endometrial cancer[4]. Hence, the collection of uniform data from many institutions might be beneficial, particularly when considering diverse clinical situations and settings. The objective of this study was to assess and compare the surgical outcomes, both during and after the operation, as well as the oncologic outcomes, of LS and LT staging surgery in patients with adenocarcinoma endometrial cancer. The study focused on a specific group of patients, treated at a single center, and aimed to evaluate the effectiveness and safety of laparoscopic surgery in this particular population.

2. MATERIALS AND METHODS

A retrospective analysis was conducted on the data of patients who had surgical staging for adenocarcinoma endometrial cancer at the gynecologic oncology department of a government hospital from 2018 to 2023. The study included 250 patients who were diagnosed with intermediate or high-risk adenocarcinoma endometrial cancer based on preoperative evaluation or intraoperative frozen assessment. These patients underwent LS or LT hysterectomy, bilateral salpingo-oophorectomy, and bilateral pelvic and para-aortic lymphadenectomy for treatment during the specified period. Patients with histopathologic findings that were not of the adenocarcinoma type, patients who underwent chemotherapy or radiotherapy prior to surgery for endometrial cancer, patients who required a second operation for additional surgery after hysterectomy, and patients who did not undergo a thorough pelvic and para-aortic lymph node dissection were excluded from the study. The diagnosis of intermediate high-risk adenocarcinoma endometrial cancer was determined based on the criteria provided by oncology experts. The choice to proceed with surgery and adjuvant treatment was also made in accordance with these guidelines. According to our department's standard procedure, patients who exhibit any of the following characteristics cancer Grade 2-3, cancer diameter over 2 cm, or myometrial invasion depth greater than 50%, undergo staging surgery were included in the study[5]. The same proficient surgical team, with expertise in endoscopic gynecologic oncological surgery, conducted all the procedures[6]. Every patient was provided with information on the benefits and drawbacks of both laparoscopic and laparotomic surgery. Based on the patient's preference, the LS setup was chosen when it was suitable, but in other circumstances, the LT procedure was conducted. The surgeon's preference was for LS, given that the decision was in their hands. None of the patients had LS-assisted vaginal hysterectomy under any conditions. The method remained consistent throughout the research period, resulting in a uniform use of both surgical routes. As a result, there was no rise in the percentage of laparoscopic surgeries throughout the years. None of the patients had routine bowel preparation. This research comprised individuals who received comprehensive surgical staging for endometrial cancer. The uterus was extracted vaginally, while the lymph nodes were removed from the abdominal cavity via trocar ports and placed in separate endobags. A surgical procedure called pelvic lymph node dissection was carried out in the region surrounded by the bifurcation of common iliac vessels above, psoas muscle on the side, ureter towards the middle, circumflex iliac vein below, and obturator nerve towards the back. On the other hand, the para-aortic lymph node dissection involved removing lymph nodes near the aorta and vena cava up to the level of the renal vein above. Oral feeding was initiated after the occurrence of bowel movement following the surgery. The surgical drain, which was inserted into each patient during the procedure, was removed after the cessation of visible chylous or hemorrhagic discharge[7]. The staging was conducted in accordance with the FIGO (International Federation of Gynecology and Obstetrics) classification[8]. Patients were monitored at intervals of 3 months during the initial 2-year period, every 6 months for the subsequent 3 years, and then once a year thereafter. DFS was defined as the duration between surgery and the occurrence of a relapse or the most recent follow-up. On the other hand, OS was defined as the duration between surgery and either death or the most recent follow-up.

2.1. Grouping of patients

The patients were categorized into two groups based on their surgical procedures, either LT or LS. The study compared various sociodemographic features, including age, body mass index (BMI), smoking status, parity, comorbidities, the American Society of Anesthesiologists (ASA) score, presence of previous abdominal surgery, and menopausal status. It also analyzed histopathologic data such as tumor diameter, grade, myometrial invasion, peritoneal cytology, FIGO stage, and the number of pelvic and para-aortic lymph nodes removed and found to be metastatic. Perioperative data, including operation duration, intraoperative complications (such as bladder/ureter/bowel or vascular injuries), conversion rate from laparoscopic to laparotomy, the difference between postoperative and preoperative hemoglobin (Hb) values as an indicator of blood loss, postoperative first flatus and oral alimentation time, time of drain withdrawal, and duration of hospitalization were also compared. Oncologic data, such as rates of adjuvant treatment, recurrence rates, and disease-free survival (DFS) and overall survival (OS) outcomes, were analyzed for both groups.

2.2. Statistical Analysis

The data was statistically analyzed using SPSS software (Version 25.0, SPSS Inc., Chicago, IL, USA). Categorical measures were quantified using numerical values and percentages, while continuous measurements were summarized using either the mean and standard deviation or the median and range, as appropriate. The connection between categorical measures and surgical method was assessed using either Chi-square or Fisher exact tests. When comparing continuous measures between groups, we assessed the distributions. The Student t-test was employed for variables that exhibited a parametric distribution, whereas the

Mann-Whitney U test was utilized for variables that did not exhibit a parametric distribution. The study utilized Kaplan-Meier survival analysis and log-rank test to assess and compare survival rates. A significance level of 0.05 was used for all tests.

2.3. Ethical Approval

The Institutional Review Board of our institution authorized this study (Project No. TNA20/183, 22/04/2023). The processes adhered to the Helsinki Declaration of 1975, as amended in 2000. Prior to their therapy, all patients provided informed consent.

3. RESULTS

A total of 250 patients diagnosed with intermediate or high-risk adenocarcinoma endometrial cancer underwent staging surgery. Among them, 120 patients (47.48%) received laparotomic surgery, while 130 patients (52.52%) underwent laparoscopic surgery. The average age of the patients was 63.51 ± 8.51 years, and the average BMI was 34.81 ± 8.22. In a comparison of laparotomy (n=120) and laparoscopy (n=130) outcomes, mean age (63.51±8.51 vs. 62.75±10.55 years, p=0.431) and BMI (34.81±8.22 vs. 35.91±8.31 kg/m², p=0.922) showed no significant differences. Parity, smoking, menopausal phase, coexisting conditions, and previous surgeries also exhibited comparable distributions between groups (p>0.05). The demographic characteristics of both groups are presented in Table 1. Comparison between American Society of Anesthesiologists scores (I-II: 63.9% vs. 69.1%; III-IV: 34.9% vs. 32.1%) showed no significant difference (p=0.311). Cancer size (median 4.0 cm for both, p=0.471) and tumor grades (Grade 1: 43.2% vs. 46.1%, Grade 2: 42.1% vs. 44.9%, Grade 3: 15.9% vs. 9.2%) were similar. Myometrial infiltration (>50%: 27.1% vs. 16.9%, <50%: 72.9% vs. 81.1%) also demonstrated no significant difference (p=0.161). The ASA scores of the groups were comparable. The demographic characteristics of both groups are presented in Table 2. These parameters were found to be comparable across the groups (P > 0.05). Regarding histopathologic aspects, there were no notable distinctions in tumor diameter, grade, myometrial invasion, and FIGO stage between the groups who underwent LT and LS procedures are presented in.Table 3. Comparison of FIGO stages between groups showed similar distributions: Early Stage-Ia (60.1% vs. 77.1%, p=0.13), Advanced Stage-Ib (17.0% vs. 12.1%), Intermediate Stage-II (5.1% vs. 2.9%), Stage III, Substage a (3.5% vs. 2.9%), Stage III, Substage c1 (3.5% vs. 2.2%), Stage III, Substage c2 (7.7% vs. 2.9%), and Fourth Stage (3.1% vs. 1.5%). All patients had negative peritoneal cytology, as indicated in Table 1. Comparing the perioperative characteristics of the patients, it was found that the duration of the surgery was substantially longer in the L/S group. On the other hand, patients who had L/T had significantly larger times for postoperative flatus, drain removal, and hospital stay (P = 0.000 for all parameters). The disparity in hemoglobin (Hb) levels between postoperative and preoperative stages was likewise more pronounced in the LT group (P = 0.063). The number of pelvic and para-aortic lymph nodes excised, as well as the number of metastatic pelvic and para-aortic lymph nodes, was substantially greater in patients who had laparotomic surgery (P values 0.000, 0.000, 0.018, and 0.035 respectively) [Table 4]. In patients with BMI >30, laparotomy (n=59, 38.2%) compared to laparoscopy (n=121, 61.8%) showed significant differences in operation duration (160 vs. 190 minutes, p=0.000), first flatus time (2 vs. 1 day, p=0.001), hospitalization duration (5 vs. 4 days, p=0.000), total pelvic lymph node numbers (33 vs. 24, p=0.000), total para-aortic lymph node numbers (31 vs. 16, p=0.001), metastatic pelvic lymph node numbers (0 vs. 0, p=0.004), and metastatic para-aortic lymph node numbers (0 vs. 0, p=0.009). Hb difference and drain removal did not show significant differences between the groups (p>0.05) table 5.

Table 1: Sociodemographic Attributes

Demographic variables	Laparotomy (n=120)	Laparoscopy (n=130)	P
Age (Mean±SD)	63.51±8.51	62.75±10.55	0.431
Body mass index (Mean±SD)	34.81±8.22	35.91±8.31	0.922
Parity (Median, range)	3.0 (0-8)	3.0 (0-9)	0.401
Smoking (%)	17.1	13.9	0.609
Menopausal phase (postmenopausal %)	87.9	83.1	0.169
Coexisting condition (%)	71.1	73.2	0.793
Previous abdominal surgery (%)	40.1	40.6	1

Table 2: American Society of Anesthesiologists Score

Score	Laparotomy (n=120)	Laparoscopy (n=130)	P
I.II (%)	63.9	69.1	0.311
III.IV (%)	34.9	32.1	
Cancer size (cm) (Median, range)	4.0 (0-11)	4.0 (0-7)	0.471
Grade 1 (%)	43.2	46.1	0.251
Grade 2 (%)	42.1	44.9	
Grade 3 (%)	15.9	9.2	
Infiltration of the myometrium (%)			
<50%	72.9	81.1	0.161
>50%	27.1	16.9	

Table 3: International Federation of Gynecology and Obstetrics stage

FIGO International Federation of Gynecology and Obstetrics stage (%)	Laparotomy (n=120)	Laparoscopy (n=130)	P
Early Stage-Ia	60.1	77.1	0.13

Advanced Stage-Ib	17.0	12.1
Intermediate Stage-II	5.1	2.9
Stage III, Substage a	3.5	2.9
Stage III, Substage c1	3.5	2.2
Stage III, Substage c2	7.7	2.9
Fourth Stage	3.1	1.5

Table 4: Postoperative prognosis for every patient and for the instances having BMI >30

All patients (n=250)	Laparotomy (n=120) (Median, range)	Laparoscopy (n=130) (Median, range)	P
Surgery duration (minutes)	120 (70-300)	180 (70-360)	0
Hb variance (g/dL)	1.89 (0.7-5.1)	1.78 (0.5-3.4)	0.063
1st flatus time (day)	2 (1-5)	1 (1-3)	0
Drain removal (day)	4 (2-16)	3 (1-12)	0
Duration of Inpatient care (day)	6 (3-20)	4 (2-15)	0
Total pelvic LN numbers	33 (6-63)	27 (9-50)	0
Total para-aortic LN numbers	33 (2-91)	20 (2-62)	0
Metastatic pelvic LN numbers	0 (0-15)	0 (0-4)	0.018*
Metastatic para-aortic LN numbers	0 (0-45)	0 (0-3)	0.035*

significant

Table 5: Postoperative prognosis for every patient and for the instances having BMI >30

Patients with BMI >30 (n=198)	Laparotomy (n=59, 38.2%) (Median, range)	Laparoscopy (n=121, 61.8%) (Median, range)	P
Operation duration (minute)	160 (85-245)	190 (65-305)	0.000*
Hb difference (g/dL)	2.0 (1.0-3.4)	1.76 (0.4-3.5)	0.124
First flatus time (day)	2 (1-4)	1 (1-3)	0.001*
Drain removal (day)	4 (2-7)	3 (1-8)	0.068
Duration of hospitalization (day)	5 (3-14)	4 (3-14)	0.000*
Total pelvic LN numbers	33 (20-65)	24 (12-45)	0.000*
Total para-aortic LN numbers	31 (3-75)	16 (3-62)	0.001*
Metastatic pelvic LN numbers	0 (0-20)	0 (0-3)	0.004*
Metastatic para-aortic LN numbers	0 (0-45)	0 (0-1)	0.009*

significant

Table 6: Oncologic outcomes

	Laparotomy(n=120)	Laparoscopy(n=130)
Adjuvant therapy (%)		
None	51.8	63.9
Brachytherapy	23.1	21.7
External beam radiation and Brachytherapy	1.7	3.5
Chemotherapy	8.5	3.5
Chemotherapy and Brachytherapy	3.8	1.5
Chemotherapy and External beam radiation	2.4	1.5
Chemotherapy, Brachytherapy, and External beam radiation	8.6	4.2
Recurrence (%)	6.8	2.2

P>0.05 for all parameters.

Table 7: Survival rates from 1 year to 5 year

			95% Statistical interval					
	Estimated Mean	Normal Error	Lower threshold	Upper threshold	1-year survival rate %	3-year survival rate %	5-year survival rate %	P
Overall survival	91.5	1.2	89.2	94.1	97.3	96.1	92.1	
Disease-free survival	91.4	1.3	88.3	93.9	98.7	97.1	93.8	
Laparotomy (OS)	90.5	1.6	87.7	94.3	97.4	94.2	93.4	0.316
Laparoscopy (OS)	72.7	1.1	70.2	74.7	97.2	97.2	94.2	

4. DISCUSSION

Our study found that laparoscopic surgery was much more effective than laparotomic surgery in terms of perioperative outcomes. While the Laparotomy (LT) group had significant greater number of excised and metastatic lymph nodes, and this disparity did not impact the oncologic outcomes. Both groups had equivalent results in this regard. Although no substantial disparity was detected in the intraoperative complication rates between the two groups, it was noted that any intraoperative difficulties that arose during laparoscopic surgery may be effectively addressed either by laparoscopic means or by converting to laparotomic surgery. The lack of substantial disparity in the demographic parameters of both groups in our study enhances the reliability of comparing surgical methods. Furthermore, it illustrates that these characteristics are not given priority when selecting patients for surgical procedures. While several research has shown similarities in the demographic characteristics of the groups, there are also publications that highlight disparities[9]. In the study conducted by Eoh and co-authors it was observed that the average age of the patients was much greater in the LT group. On the other hand, reported that the BMI was significantly lower in the LS group[10]. The perioperative results in the LS group in our research demonstrate a comparable level of superiority to prior studies in the literature. A randomized controlled trial compared the outcomes of LS and traditional staging (LT) in endometrial cancer and revealed that laparoscopic staging resulted in fewer negative effects during both the intraoperative and postoperative periods[11]. The study's ancillary data showed that the rates of recurrence and survival were similar between the two staging methods. Subsequent studies have also indicated that laparoscopic surgery results in longer operation time, but less blood loss and shorter hospital stays. Conversely, there are studies that indicate comparable durations of surgery amongst the groups, and they attribute this to the surgeons' level of expertise. Earlier reports indicated that the learning phase of pelvic lymphadenectomy involved around 20 procedures, whereas para-aortic lymphadenectomy required over 100 procedures[12]. Existing evidence indicates that open surgery has been found to elevate perioperative complications in obese patients. Nevertheless, it has been observed that the conversion rate to LT has also risen in correlation with rising BMI due to factors such as restricted access to pelvic organs and insufficient lymphadenectomy. Thus, we conducted a comparative analysis of perioperative outcomes between the subgroup of individuals with a BMI more than 30 in the LS and LT groups in our research. Within this subgroup, in contrast to the entire population, the duration for drain removal was shown to be comparable between the two groups. The postoperative and preoperative disparities in hemoglobin levels were comparable between the two groups, and other outcomes were much better in the LS group, consistent with the entire population. Therefore, considering the surgical expertise, it is suitable to prioritize LS for this particular category as well. The study encountered exclusively vascular injuries as consequences, and no notable disparity was seen between the two groups. The Cochrane statistics also indicated that there is no statistically significant difference in terms of complications between laparoscopic and laparotomic operations. Within the literature, there exist studies that exclude the reporting of consequences, while others document occurrences of bladder damage and vascular problems. The choice to convert from LS to LT cannot be based on the management of difficulties. Additional factors that might impede the successful completion of surgery include suboptimal visibility caused by the absence of an ideal trendelenburg posture, as well as anatomical challenges resulting from extensive adhesions or a big uterus[13]. Within our analysis, 22 patients (15.1%) in the LS group had conversion to LT, with just four of these conversions being a result of intervention owing to complications. Early research found that 23.7% of patients experienced a conversion from LS to LT. This conversion was linked to higher BMI, metastatic illness, and older age[14]. However, the specific complexity of the situation also influences the selection of LT. In their analysis of 151 cases, they found that none of the patients underwent conversion to LT. However, the rate of para-aortic lymphadenectomy was quite low at 2.7% in the LS group. Furthermore, there were no recorded cases of vascular damage, but two patients did require surgical repair for bladder injury. Dinoi and co-authors observed no problems or conversions to laparotomy/tubal ligation (LT) in their laparoscopy/salpingectomy (LS) group and 4.1% of their laparoscopic surgeries had to be changed to open surgery (LT) because to vascular injury and damage to the ureter[15]. In our analysis, the LT group had a considerably greater number of excised and metastatic lymph nodes compared to both the entire population and the subgroup with a BMI >30. While previous studies often did not include a thorough removal of para-aortic lymph nodes in all patients and focused mainly on evaluating pelvic lymph nodes, and there are studies suggesting that removing more lymph nodes through either LT or LS procedures may be beneficial. However, there are also studies showing no significant difference between the two groups. Prior research has indicated that an average of 8 to 22 pelvic lymph nodes is often retrieved during laparoscopic or robotic surgery, while an average of 6 to 21 pelvic lymph nodes is typically obtained during open surgery[16]. The figures representing the removed mean para-aortic lymph nodes are indicated as 2.6 to 11 for LS and 3.1 to 10 for LT. Several studies have shown that the quantity of pelvic and para-aortic lymph nodes removed in LS is equal to or greater than those removed in LT. This has been linked to improved visibility. The overall survival rates were 97.3% at 1 year, 96.1% at 3 years, and 92.1% at 5 years, with an estimated mean of 91.5 and a normal error of 1.2. Disease-free survival rates were 98.7% at 1 year, 97.1% at 3 years, and 93.8% at 5 years, with an estimated mean of 91.4 and a normal error of 1.3. For laparotomy patients, overall survival rates were 97.4% at 1 year, 94.2% at 3 years, and 93.4% at 5 years (p=0.316). Laparoscopy patients had overall survival rates of 97.2% at 1 and 3 years, and 94.2% at 5 years. In this investigation, we did not find any statistically significant difference between the adjuvant therapies in both groups, which is consistent with earlier research. Nevertheless, for patients requiring adjuvant therapy, opting for LS may offer greater benefits due to reduced perioperative problems and a shorter recovery period, which can help avoid any delays in subsequent treatment. The lack of a substantial disparity in terms of recurrence and survival durations across our groups is likewise in line with prior research. Furthermore, the Cochrane data indicated that the findings for LS were comparable to those for LT in terms of DFS and OS in early-stage adenocarcinoma endometrial cancer. While it is advisable to do extended follow-up for a comprehensive evaluation in this regard, performing LS in suitable circumstances is endorsed. A significant constraint of our work is its retrospective character. The potential for bias in patient selection exists; nevertheless, the lack of notable disparity in demographic parameters, such as BMI and previous

abdominal surgery, between the two groups indicates that these factors did not significantly impact the study's findings. Furthermore, as the study only examined the cases of a skilled team, the results may not accurately reflect the safety levels of surgeons with varying degrees of experience and seniority. In addition, due to the timing of the surgeries, the patients were not monitored for a period of 5 years. As a result, the survival rates at 1 year, 3 years, and 5 years were reported for both groups. However, the majority of studies in the existing literature have included all different forms of endometrial cancer patients based on histopathological characteristics. Non-adenocarcinoma endometrial cancer exhibits similarities to ovarian cancer rather than endometrial cancer in some ways. This can impact the comparability of perioperative and oncologic outcomes between the LS and LT groups. In order to mitigate bias, we opted for a homogenous population that would enable a more accurate evaluation of the surgical approaches. Hence, the merits of our research lie in its execution at a single facility by a consistent surgical team, with a uniform population, and the inclusion of comprehensive pelvic and para-aortic lymph node dissection for all patients. To summarize, this study provides evidence that laparoscopic surgery offers several benefits compared to LT in various aspects. Depending on the surgeon's expertise, it can be safely used for surgical staging of adenocarcinoma endometrial cancer in both the general population and patients with high BMI.

5. FINANCIAL SUPPORT AND SPONSORSHIP

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6. AUTHORS CONTRIBUTION STATEMENT

Study conception and design: Dr. Kumud Kumari, Dr. Nidhi Jha; data collection: Dr. Narendranath.S; analysis and interpretation of results: Dr. John Abraham, Dr. Ramesh Vasudevan; draft manuscript preparation: Dr. C. Srilakshmi. All authors reviewed the results and approved the final version of the manuscript.

7. CONFLICTS OF INTEREST

Conflict of interest declared none.

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