

An Analysis on the Efficiency of the Uterine Fibroid Treatment

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Abstract—Uterine fibroids are a most important health related problem in the women of twentieth century. Fibroids are fibrous tissue that grows in the uterus. The presence of fibrous connective tissue was common in the women of reproductive age and sometimes it was identified after menopause period. The most likely appearance of fibroids is due to the effect of hormones, progesterone and estrogen on the woman's menstrual cycle. All the fibroids do not require treatment; 2-7% of fibroids will shrink during the time of menopause. Uterine fibroids can be treated surgically, medically and sometimes by minimal access techniques. Depending on age, childbearing aspirations, symptoms in the patient and the number, size and location fibroids, the selection of treatment should be individualized. Surgical and non-surgical management of fibroids consist of hysterectomy, myomectomy uterine artery embolization, radiologic and ultrasound treatment are used to induce thermal removal of fibroid. This study analyses the issues related with uterine fibroids and about the impact of different pharmaceutical treatment on patient's health and quality of life. The data were collected from women, suffered with fibroid problems and data mining techniques were used to analyze the data. Finally with the data mining techniques, the favourable method for managing uterine fibroids is identified.

Keywords—Uterine Fibroids, Treatment, Hysterectomy, Myolysis, Impact, quality of life.

I. INTRODUCTION

Uterine fibroids are common tumors with an estimated occurrence of 30%–60% in women in their reproductive age. They are tumors of the muscle cells which consist a medium with collagen and proteoglycan. As most of the untreated fibroids shrink after menopause, it is considered that estrogens and progesterone proliferate tumor growth. Based on the location and size fibroids can be categorized as subserous, intramural, or submucous). Fibroids may be single or multiple. The hormone, luteinizing hormone (LH) kindles uterine growth during early pregnancy, it is reported that perimenopausal increases in LH that will result in fibroid growth. Symptoms from fibroid are due to the size and position of fibroid in the uterus. Common symptoms are pelvic pain,

heavy bleeding and reproductive dysfunction [1]. The surgical treatment, hysterectomy is the best way for treating fibroid as it completely reduces the risk of having it again. But it was not preferred by most of the women in case of their preference to preserve uterus and some may have high risk of surgical complications. Over the last few decades new methods of treatment are offered to those who are not willing to remove their uterus.

II. REVIEW OF THE RELATED STUDY

Uterine fibroids can significantly weaken patient's quality of life which results in absenteeism and decreased productivity in the workplace [1]. Fortin C, et al., provided an overview of the impact of fibroids on the quality of life and analysed the effect of various treatments on it [14]. He prepared a questionnaire of 36 questions to measure eight different aspects of health: physical functioning, mental health, body pain, social functioning, role limitation, general health because of emotional problems and physical health. He analysed that approximately out of four one woman with fibroids states that negatively impacted their work performance. Both surgical and medical are available to manage symptomatic UFs [3].

Jacques Donnez, et al., investigated the result and efficiency of using ulipristal acetate for managing uterine fibroids and found the result that over bleeding is controlled and volume of fibroid has been reduced [15]. Even in the intervals of off-treatment quality of life has been improved and no adverse reaction was caused because of the repeated treatment. He observed that percentage of tumors has been decreased from 7.4% which was recorded after the first treatment to 4.9% in subsequent treatments.

Flynn M, et al., presented that Hysterectomy is the conventional solution for the treatment of fibroids, but it sacrifices women's fertility. So women who do not prefer to preserve their uterus will opt this option [4]. Other less invasive uterus-moderate alternatives are suitable for the women those who wish to preserve their uterus [5,6]. Based on the size, number, location and experience of the surgeon Myomectomy is a suitable alternative method for removing Uterine Fibroids and it can be done using hysteroscopy and laparoscopy. The patients those were advised to undergo surgery can be recommended for UAE. But, when considering

pregnancy, it should be revised as complication with abnormal placentation were depicted [7,8].

Lefebvre G, et al., concluded that Myolysis is a best option for women suffering with subserous or intramural fibroids, if they want to preserve their uterus but not fertility [9] and [10]. Though Magnetic Resonance-guided Focused Ultrasound (MRgFUS) is still being considered as the experimental method, it is the most effective and least aggressive type of procedure[11].

Melody Taheri, et al., compared the data on fibroid and uterine volume reductions following the treatments for fibroids[12]. He analyzed that Fibroid and uterine volume reductions have been revealed with UAE, RFA and US. Compared with US, RFA and UAE are identified with significant fibroid volume reduction. The fibroid volume was reduced by 70% for RFA, 54% for UAE and 32% for FUS at six months post-treatment.

Annefleur M. de Bruijn, MD et al., compared the 10- year outcome of the UAE and hysterectomy[13]. After 10 years of follow-up, he found that quality of life and life satisfaction give no difference between these two methods. He concluded that all women having symptomatic uterine fibroids who are suggested for hysterectomy should be advised for UAE.

III. SIGNIFICANCE OF THE STUDY

This study of fibroids has been conducted in Theni district by collecting and analyzing data related with diagnosis and treatment of fibroids among women. It analyses the various treatments used for removing fibroids and about post-treatment effect on the health related life style of women. This study paper produces the results for finding the best method of treatment for managing fibroid. Finally this study analyzed the problem of occurrence of fibroids and various methods for handling them. And it also identified whether surgical or non surgical treatment is better for getting cure from fibroids. Table 1 summarises the factors or symptoms that represent the analysis of the presence of uterine fibroids.

TABLE I
DIAGNOSIS OF FIBROID

Heavy bleeding	Pelvic Pain	Lower back pain	Pain during sex	Frequency of urination	causes
No	No	No	No	No	There is no Fibroid
High	High	High	High	No	Severe(Suffering from Fibroid)
No	No	No	High	High	Mild(Starting Stage)

The treatment will affect the life style and health of the patients and childbearing aspirations of the women.

IV. STATEMENT OF THE PROBLEM

Patients with fibroids are on the lookout for uterus-preserving treatments with minimal invasion to heal their problems. This has showed the way to a greater use of other methods such as Focused Ultra Sound(FUS), Uterine Artery Embolization(UAE) and recently RadioFrequency Ablation(RFA) of fibroids. The fibroids, present in the uterus wall can be treated with a minor procedure, hysteroscopy. In women who do not wish to become pregnant, they prefer the hysterectomy.

V. OBJECTIVE OF THE STUDY

All patients with symptoms of fibroid cannot be treated by same therapeutic approach. The choice of appropriate treatment is based on factors such as person's age, childbearing aspirations, location, size, symptoms, number of fibroids and closeness to menopause. It discusses and explores the pros and cons of the available treatment options (both surgical and nonsurgical) for managing uterine fibroid. The treatment types are progesterone receptor modulators with ulipristal acetate, UAE, FUS and surgery. The main objective of the study is to identify the best method for fibroid treatment in cases the patient wish to protect uterus or not.

VI. THE PROPOSED WORK

The present study is an investigation research conducted among the women in Theni. In order to follow the aim and objectives outlined in the above section, a content analysis of information gained from the research process was conducted to establish the underlying trends in location to find common diseases.

Methodology

The Fig. 1. explained the different stages of this study. The first stage consists of collecting the information from the women those having fibroid problems.

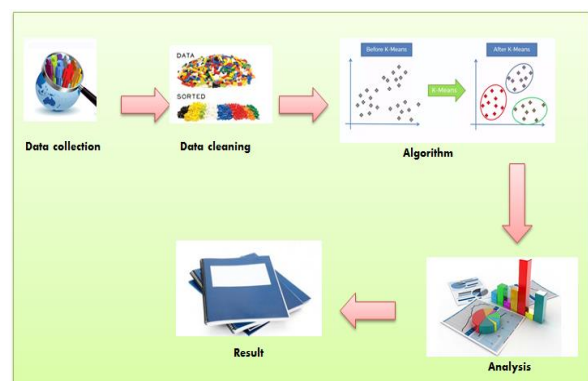


Fig.1 Methodology of The Proposed System

A questionnaire with 25 questions was prepared to get information about the diagnosis and efficacy of different treatment methods toward the fibroids. The questions were framed in a way to retrieve all the related details about the diseases and treatments. The second stage involves the

method of eliminating the information which are not needed for the processing for the result. In this study, some respondent's response was not related to the analysis. To do the work of data cleaning, the women with the absence of the symptoms which are relevant to the fibroid disease are need to be neglected. So out o 250 women, thirty-one patients were taken away from the study. The first and second stage were grouped to retrieve the information from the women with fibroid symptoms.

Table 1 gives the parameters that are used to identify the occurrence of tumors in women. An analysis was carried out by making specific assumptions in a hypothetical situation. In order to perform the expected operation an algorithm has to be selected for processing the cleaned data. For this study, k-means clustering algorithm has been selected as it provides a easy way for classifying the data set based on certain number of clusters. K centers are defined for each cluster. Homogenous subgroups were found for different types of treatment and its effects. After applying the algorithm, the receive results were analyzed to get an obvious inference. The report was prepared for the outcome of the various treatments and their impact on life and health of the patients. In the last and the final stage, on the basis of the results and interpretations, specific postulates were framed on each postulate hypotheses and tested through quantitative research using data mining algorithm. The above mentioned stages have been described as objectives in the preceding paragraph.

Data Mining Technique: Data mining is the core process of knowledge discovery in databases. It is the process of extraction of useful patterns from the large database. To analysis the large amount of collected information, the area of Knowledge Discovery in Database (KDD) provides techniques to extract interesting patterns in a reasonable amount of time. Data mining is the application of efficient algorithms to detect the desired patterns contained within the given data. It is the extraction of hidden descriptive of predictive information from large databases.

k-means is one of the simplest unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed apriori. The main idea is to define k centers, one for each cluster. These centers should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest center. When no point is pending, the first step is completed and an early group age is done. At this point we need to recalculate k new centroids as barycenter of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new center. A loop has been generated. As a result of this loop we may notice that the k centers change their location step by step until no more

changes are done or in other words centers do not move any more. Finally, this algorithm aims at minimizing an objective function know as squared error function given by:

$$J(V) = \sum_{i=1}^c \sum_{j=1}^{c_i} (\|x_i - v_j\|)^2$$

where,

$\|x_i - v_j\|$ is the Euclidean distance between x_i and v_j .

' c_i ' is the number of data points in i^{th} cluster.

' c ' is the number of cluster centers.

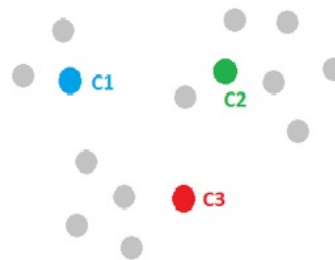
Algorithmic steps for k-means clustering

Let $X = \{x_1, x_2, x_3, \dots, x_n\}$ be the set of data points and $V = \{v_1, v_2, \dots, v_c\}$ be the set of centers.

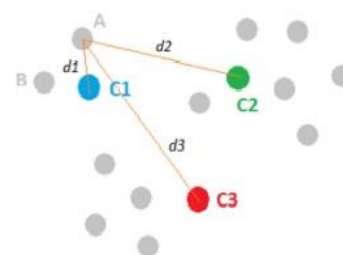
- 1) Randomly select ' c ' cluster centers.



- 2) Calculate the distance between each data point and cluster centers.



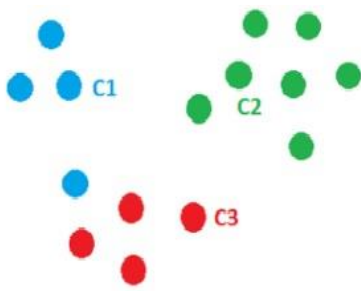
- 3) Assign the data point to the cluster center whose distance from the cluster center is minimum of all the cluster centers..



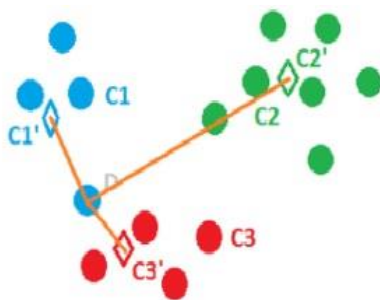
- 4) Recalculate the new cluster center using:

$$v_i = (1/c_i) \sum_{j=1}^{c_i} x_j$$

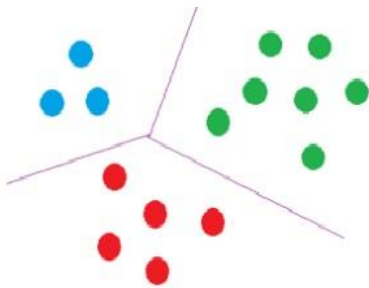
where, ' c_i ' represents the number of data points in i^{th} cluster.



5) Recalculate the distance between each data point and new obtained cluster centers.



6) If no data point was reassigned then stop, otherwise repeat from step 3).



The K-means algorithm converges to local optimum. So the result found by k-means is not necessarily the most optimal one. The initialization of the centres is critical to the quality of the solution found. There is a smarter initialization method called K-means++ that provides a more reliable solution for clustering. The user has to select the number of clusters ahead of time. K-means clustering can be applied to many use cases in healthcare and help us to better characterize subpopulations and diseases by medical conditions.

Fig 2 explained the flow diagram of the steps involved in the execution of K-means algorithm. For clustering the groups, data centres were identified based on the different parameters used to analyse the effect of treatments for the fibroids.

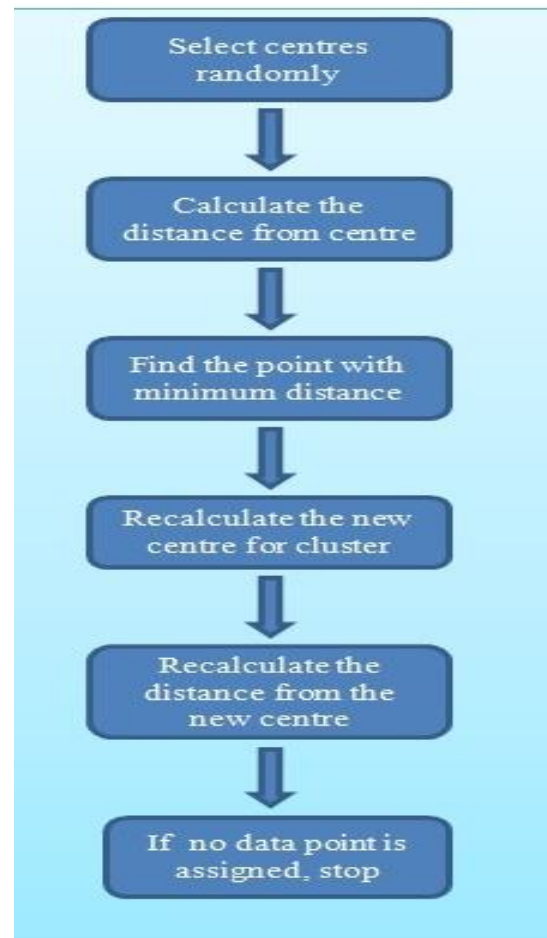


Fig 2. Flow diagram of K-Means algorithm

Data sources and methodology:

Target population: This survey covers all the villagers of Theni district.

Instrument design: This questionnaire collects data on the attitude of the people regarding impact of television serials on rural women and adults. The items and reasons on the questionnaire have remained unchanged for several years. However, should modifications become necessary, proposed changes would go through a review committee and a field test with respondents and data users to ensure its relevancy.

Sampling: This survey is a census with a cross-sectional design. Data are collected for particular units of the target population, therefore sampling is done.

Data sources: Responding to this, survey is mandatory. Data are collected directly from survey respondents. Data are compiled from the responses the researcher collected by the questionnaire. The researcher performs the data capture activities, and follow-up of non-respondents. Contact with respondents is maintained for subsequent follow-up.

Error detection: There are edits built into the data capture application to check the entered data for unusual values, as well as to check for logical inconsistencies. Whenever an edit

fails, the interviewer is prompted to correct the information (with the help of the respondent when necessary). For most edit failures the interviewer has the ability to override the edit failure if necessary.

Imputation: A 100% response rate is attained; therefore imputation is not necessary.

Quality evaluation: Prior to the data release, combined survey results are analyzed for comparability; in general, this includes a detailed review of individual responses, general economic conditions, and historical trends. The data is examined at a macro level to ensure that the long-term trends make sense when compared to publicly available information in media reports, and etc.

Disclosure control: Releasing any data would divulge information obtained under the Statistics Act that relates to any identifiable person, business or organization without the prior knowledge or the consent in writing of that person, business or organization. Various confidentiality rules are applied to all data that are released or published to prevent the publication or disclosure of any information deemed confidential. If necessary, data are suppressed to prevent direct or residual disclosure of identifiable data.

Revisions and seasonal adjustment: Revisions in the raw data are required to correct known non-sampling errors. These normally include replacing imputed data with reported data, corrections to previously reported data, and estimates for new births that were not known at the time of the original estimates. Raw data are revised, on a monthly basis, for the month immediately prior to the current reference month being published. The purpose is to correct any significant problems that have been found that apply for an extended period. The actual period of revision depends on the nature of the problem identified.

VII. RESULT AND ANALYSIS

Sampling: This survey is a census with a cross-sectional design. Data are collected for particular units of the target population, therefore sampling is done.

During the period studied, we identified 250 women with fibroids. Thirty-one patients were excluded based on the criteria described above (Figure 1). One hundred and sixty-three (163) women with fibroids were included and matched with 326 controls in a 1:2 ratio. The causes of infertility did not vary significantly between the two groups ($P = 0.43$). Sixty-nine women (42.3%) had a single fibroid and 94 women (57.7%) had multiple fibroids, ranging from two to eight. For each variable the size of difference between groups was reported with corresponding confidence intervals. For the binary categorical variables, the figures are in the form of odds ratios. These indicate the odds of being in the next-highest category (e.g. 9–19 relative to 5–8) for cases relative to controls. The mean difference (calculated as cases – controls) is shown for the normally distributed continuous variables, whereas the ratio of values in cases relative to controls is shown for the non-normally distributed variables.

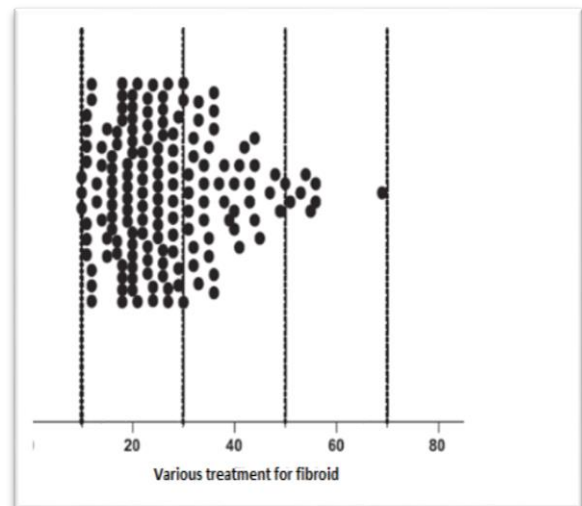


Fig3 the results of Various treatment for Fibroid

Pregnancy outcomes Clinical pregnancy and live birth rates were analysed for all women. Further subgroup analyses were performed for women with single or multiple (≥ 2) fibroids and for women with treatment of laparoscopy and surgery. This rounded cut-off was based on the results of the study by Yan et al.⁹ Overall, the presence of fibroids was associated with lower clinical pregnancy and live birth rates. Women with fibroids, wish to have pregnancy, select myolysis.

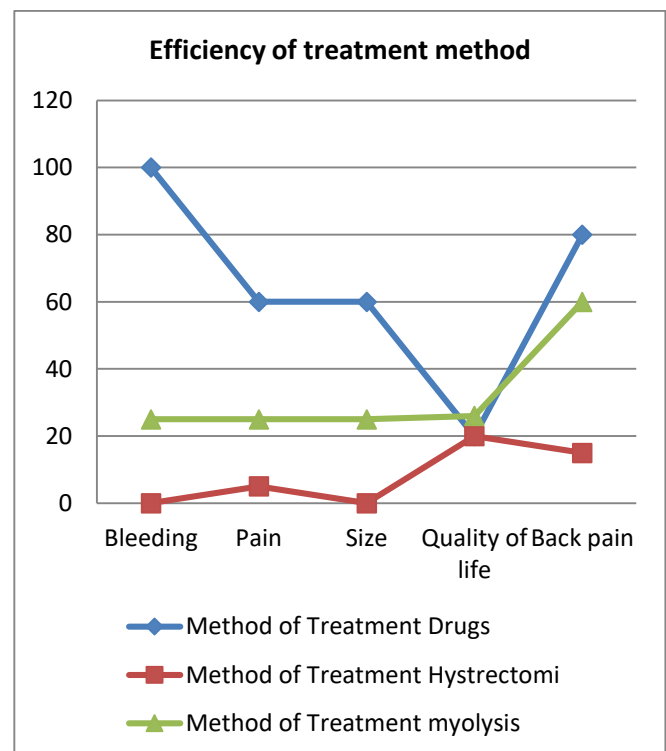


Fig. 4. Efficiency of treatment method

Fig4 predicted the efficacy of the various approaches towards the treatment of fibroids in the uterus. Hysterectomy

effects with decrease in the pain due to the presence of fibroids and stopped the bleeding. As the uterus was completely removed, size of the tumors was not considered in this case. But there was chance for back pain as the patients got involved in surgery. Quality of life was improved for women after the treatment. Consumption of drugs was efficient in case of the initial stages of the disease. Initially treated fibroids with drugs were get cured and patient's health was improved. But occurrence of tumors may happen again in some other places in the uterus. So chances for pelvic pain and back pain increased. Hysterectomy was preferred for the patients those who do not wish for preserving uterus. But women with child-bearing aspirations do not wish for removing the uterus. The better option for these patients was myolysis. Myolysis reduced the size of the tumors by cutting the blood supply to the fibroids in a way to shrink the tumors. So treatment of myolysis was a better decision for women with a desire to protect the uterus. Quality of life was improved in patients after the treatment and bleeding and pain (both pelvic and backpain) were also reduced.

Recommendations

This paper recommends that the future analysis should be done for finding the use of ayurvedic procedure in managing the fibroids. Analyzing large data set will be very much useful to have more accurate result for this study. This data measure the impact of pharmaceutical methods for treating fibroid and identified which method suits for the women depending on various factors based on age, proximity to menopause, position of fibroid and childbearing aspiration. Health and quality of life of the patients after the treatment methods are analysed and the better outcome has been chosen for the procedures. Ayurveda, the traditional method of medicine in India, especially Tamlnadu focuses on health by concentrating and treating body, mind and sprit. So this study can be extended to evaluate the usage of ayurveda in managing fibroid.

VIII. CONCLUSION

This paper examines the various treating approaches in patients with uterine fibroid and the health and quality of life after the specified treatment. All the treatment options had pros and cons and side effects correlated with each of them. Depending on most of the factors, certain treatment option is good for one woman than another. Usage of drugs is recommended as the first step to treat uterine fibroids. Some of the women get cured with this drug usage, and no more supplementary therapy is required. The most preferable method to manage fibroid is hysterectomy which is an open surgical incision to remove uterus. This will be considered as the best one for the women who doesn't want to preserve uterus. Otherwise myolysis, the approach used to demolish the fibroids and not removing. It is done as a laproscopic method to apply heat to each fibroid that will result in shrinkage of fibroids. In case of considering fertility, myolysis is the favorable pharmaceutical approach for the patients.

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