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Evaluation and Data Analytics of the Gender Vise Patients Mortality Rates For Hospital Management

Anjali Thakur
Assistant Professor
Technocrats Institute of Commerce and Sciences, Bhopal

Abstract: Especially heart hospitals are required to timely analyze the data associated to patents admission and relative mortality rates. This paper is aimed to evaluate and analyze the gendervise mortality rates for the hospital. The male and female data for mortality is evaluated and analyzed for Hospital Management (HM) project of the hospital Admissions and mortality data for Hero DMC Heart Institute is evaluated for the year 2017. The male and female mortality analysis and the days of admission are analyzed.

Key word: Hospital management, machine learning (ML), Data Analytics, mortality rates, heart patients, Gender analysis, Hero DMC Institute.

1. Introduction

The low mortality rates are the key for the success for the any hospital. It is mandatory for hospitals, particularly heart hospitals, to promptly examine data related to patient admissions and relative death rates. The objective of this paper is to assess and examine the hospital's gender-specific death rates. The hospital's Hospital Management (HM) project evaluates and analyzes the mortality data for men and women. Data on admissions and deaths are analyzed for the gender vise data.

The ML method such as T Verplancke et al (SVM), Woo Suk Hong et al.(logarithmic regression), and deep learning (DL) (HarikumarPallathadka et al, Jinai Li et al, and Ashish K Saxena et al (LSTM0 were widely used for the HM tasks. This paper has preseted the various applications of ML for HM and also preseted the case study of the Mortality rate analysis for HM system forHero DMC. The data is available at Koogle database.

2. Applications of ML in Hospital Management

The healthcare for HM is using ML more and more frequently. Soon, ML applications will frequently utilize real-time patient data from several nations, helping more patients receive cutting-edge treatments. The top uses of ML and analysis in the medical field are.

1. Determining the Illness and Treatment: In healthcare, ML is used to identify and diagnose diseases that could be difficult to detect in the early stages.
2. Drug Development and Production: Early on, ML and hospital management may be quite helpful in discovering new medications. It supports development of new technologies and research in genomes and precision medicine.
3. Diagnosis via Medical Imaging

Hospital management staff can adopt ML ased image analysis for analysis of medical images. ML makes it easier for computers to interpret and analyses images like MRIs, CT scans, and X-rays.

4. Analysis of Mortality rates. For hospitals dealing with serious patient it become essential to analyze the data for mortality rates to ensure the effectiveness of hospital staff. The ML project for this can help for analysis..
5. Make sure occupancy of Hospital staff: As a tool, ML can help to maximize the occupancy of medical staff including doctors and, nurses, support staff. This may apply the ML based production methods to determine the effective management system.
6. Smart Health Records Movement: hospitals take lot of work to keep records safe and updated. ML simplifies tasks by saving money, time, and effort
7. Clinical Research and Trials: ML has a great deal of utility in study as well as clinical studies. In the pharmaceutical sector, clinical studies may be very expensive and time-consuming.

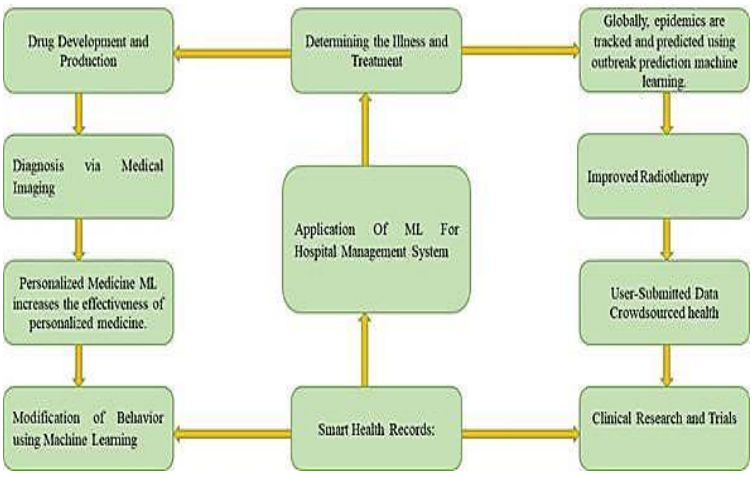


Figure 1 Applications of the HM system using ML

Researchers can locate possible trial participants fast by utilizing machine learning (ML) and predictive analytics to search via a variety of sources, including social media and past medical visits.
8. Improved Radiotherapy: Healthcare and, may greatly benefit from artificial intelligence. Machine learning (ML) techniques, which learn from several samples, facilitate diagnostic and variable identification.
9. Globally, epidemics are tracked and predicted using outbreak prediction ML iflarge volumes of data then. Artificial Neural Networks (ANN) are utilized.Various applications of HM system using ML are shown in Figure 1.

2. Literature Review

R. Andrew Taylor et al Usability difficulties and analytical methodological constraints have often limited models used in CDR creation to a predetermined small collection of variables deemed clinically important and to readily calculable rules. In addition, CDRs are often not easily generalized, require a long time to produce, and cannot be maintained as new data comes accessible. In addition to improving patient outcome prediction, more advanced machine learning & analytics methods that may leverage the multitude of factors readily accessible through health information systems (EHRs) could additionally make it easier to automate and implement clinical decision aid deployments. This evidence of concept research uses a forecast of infection mortality in hospitals as a demonstration case and compares a regional, big data motivated, machine learning strategy to current CDRs and conventional analytic methodologies. Using region beneath the curve used by the receiver (AUC) or chi-square tests research, a machine learning forecasting tool was analyzed against a model of logistic regression, a categorization and predictive tree (CART) approach, and other already-built predictive models on the valid data set.
Dr. Krishan Kumar Goyal et al Algorithms that can learn from labelled, unlabeled, or environmental data are created using machine learning techniques. Most areas employ machine learning, but the patient care industry benefits greatly from it since it uses appropriate decision- and prediction-making processes. Since machine learning for healthcare is a branch of science, we must properly archive, access, and use information as well as give knowledge about the issues confronting the industry and the data needed to make informed decisions. Over time, the medical sector has advanced significantly as a result of these innovations. Medical professionals employ algorithms based on machine learning to analyses medical information in order to evaluate and manage patients correctly, as well as to identify dangers.
HarikumarPallathadka et al AI has been used in healthcare organizations to increase crop yield, facilitate prediction, enable ongoing monitoring, streamline the management of supply chains, boost productivity, and cut down on water waste, all with the primary objective of developing standardized, dependable procedures for monitoring product quality and exploring novel approaches to reach and benefit society at a minimal cost. Machine learning along with deep learning constitute two of the greatest popular AI techniques. These models are used by people, companies, and governmental organizations to predict and derive information through data. Currently, machine learning models are currently being built for the complexities and variety of data seen in practical applications.Examples of artificial intelligence and machine learning in subjects such as social studies, administration, and medicine are covered in this paper. Among the main applications are predicting illnesses, irrigation optimization, managing inventory, identifying fraudulent activity, sales forecasting, profit maximization, growth in sales, and managing portfolios.
Sanjeev Kumar et al Under such circumstances, electronic healthcare is supplying the most current technologies to assist looking for data and connection procedures, which is helping to accelerate the expansion within the healthcare sector. In addition, an algorithm based on machine learning is employed to boost the medical industry's intelligence. Cost-saving measures, online communication, physician-patient connections through computerized health data, and privacy issues are the five primary elements of an electronic healthcare network. Compared to another current system, our suggested system offers geographically based electronic prescriptions, e-reports, disease forecasting, & one-click treatments & urgent assistance suggestions.
Woo Suk Hong et al to use histories of patients in alongside triage-related data to predict hospitalization at the conclusion of ED triage. Using three different types of datasets—one including simply triage data, another containing patient history, and a third containing the whole collection of variables—we trained a set of nine binary classification algorithms using logarithm regression (LR), gradient boosters (XGBoost), along with deep artificial neural networks (DNN). Next, by creating models on progressively larger portions of our data, we examined the possible advantage of having additional training examples. Finally, the acquired data was used as a measure to identify important factors in order to build a low-dimensional framework. Using triage data and histories of patients, algorithms can reliably predict a hospital stay. It is clear that these factors must be included in forecasting techniques since the inclusion of history data greatly enhances predicted ability as contrasted with the use of triage knowledge alone.
Abdullah Ayub Khan et al We support two distinct goals in this study. First, we provide a gradual gradient descent approach based on machine learning for electronic medical care application day-to-day transactional optimization and health information management. This method allows for optimized data transfer details and assesses the absence of medical aspects during calculation. Second, to safeguard payments and maintain permanent preservation, a secure serverless structure and blockchain-distributed electronic health care are suggested for the medical industry. The seamless implementation of medical transmissions of complex services is a goal shared by the medical businesses.
Sadia BintaKabir et al The use of a permanent healthcare capacity growth strategy that utilizes extensive reinforcement learning is the main goal of this work. To give a solution, we leverage profound reinforcement learning (RL) techniques oriented establishing policies, RNN-LSTM based demographic anticipate, and cutting-edge AI approaches. We conduct a case investigation for Jessore, which is one of the biggest cities in the southern part if the country of Bangladesh, Abhay Nagar the upper, in order to evaluate the advantages of this strategy over current narrow-minded regulations. An essential piece of architecture in each nation is

its healthcare system, which calls for long-term capacity development. The COVID-19 pandemic underscored the need for sufficient medical facilities, particularly in emerging economies such as Bangladesh.

Mihaela van der Schaar et al We think that the only way to undertake a robust clinical and social response is to use intelligence insights obtained from multiple sources of information to better manage limited medical facilities, offer individualized plans for treatment, guide policy, and accelerate research. In the present article, we outline five critical problems in the response to COVID-19 and demonstrate how advances in artificially intelligent (AI) and machine learning (ML) might help handle each one. We contend that incorporating these practices into regional, national, and global medical systems would save lives, and we suggest particular approaches for their quick and effective adoption. We expand our assets and expertise to support policymakers that wish to put these strategies into practice.

Jinai Li et al We developed a hospital administration index systems centered around a deep learning algorithm and examined the effects of using an opposite broadcasting neural networks model in hospitals in an effort to actively increase the effectiveness of health government management. The findings indicate that the developed model offers the best reliability and the smallest latency in its predictive evaluation as opposed to other traditional techniques. The weight of the reasonable utilization rate of rooms in primary general hospitals and major public healthcare facilities, respectively, is the greatest, according to a weighted assessment of each parameter in the model.

Ashish K Saxena et alThis study offers a novel method for optimizing allocation of resources inside HMS by utilizing an LSTM neural network structure. The LSTM model, which is based on deep learning, examines both past and current data, gaining insight from historical trends to provide highly accurate predictions about the needed resources. In order to show the LSTM, the model's strong prediction capacity and promise as a decision-support tool, this research compares its efficacy to real data in a variety of allocating resources situations. The first step towards providing medical facilities that become more adaptable, efficient, and compassionate is the incorporation of this framework with HMS.

VivekanandanThanigaivasan et al The medical sector is seeing a sharp increase in data, which presents an important obstacle for conventional data management platforms to handle and interpret. Since data will inevitably grow enormously, the search is on to find an efficient storage system that can manage enormous amounts of changing information. Thanks to technological advancements, cloud storage has become a viable choice. Heart disease is currently the leading cause of death for people worldwide. The forecasting of heart attacks in today's scientific studies is critically dependent on this approach.The collection of data for cardiovascular diseases is used for analysis in this work. The dataset has been used in a number of studies to assess the efficiency of methods for classification, and the results show that a support vector machine performs better than other techniques.

T Verplancke et al This study aims to assess the predictive power of multilevel logistic regression (MLR) alongside support vector machines (SVM) derived models for hospital mortality among those with blood cancers transferred to the intensive care unit. Twelve input variables were used in the first model to compare MLR with SVM. The MLR & SVM algorithms both had strong prejudiced powers. MLR and SVM did not vary statistically significantly in their selective capacity when it came to hospital death predictions in severely unwell individuals with hematological cancers.

Osman Salem et al The design and first testing of our recommended structure for recognizing anomalies in medical body area network wireless systems and widespread patient and healthcare surveillance are described in depth in this research. Our system combines cutting-edge sensor fusion methods with cutting-edge data mining and predictive algorithms. Given that sensor networks that are wireless are vulnerable to malfunctions due to constraints (such as low mathematical or energy funds), we can differentiate among faulty sensors info and erratic changes in physiological parameters of a patient via this structure, thus ensuring dependable businesses and actual time worldwide tracking from mobile devices. Patient features are measured by node sensors, and a regional processor stores the information gathered.

Ioannis E. Livieris et al In this study, we provide a unique two-level categorization algorithm-based support system for decisions for the precise prediction of hospitalized patients' duration of stay. Our computations show that compared to all single algorithms for learning studied, the suggested approach performs better in classifying. The suggested software was created to help hospital administration and improve service delivery by providing individualized support based on patients' anticipated length of stay in the medical Centre.

Shaoze Cui etmedical professionals typically utilize the LACE score approach, which has poor performance most of the time, to assess the likelihood of patient recurrence. In light of this, this work offers a unique approach for creating risk prediction models that concurrently process unbalanced data and pick characteristics using algorithms based on genetics and encourage vector machines. The goal of this system is to assist physicians in making decisions while managing the hospitalizations of diabetic patients. Furthermore, a hybrid feature choice procedure was developed to choose the crucial characteristics in order to enhance prediction accuracy. Afterwards, a better support vector machines (SVM)-based technique was created, and the method's sensitivity variable was adjusted using the genetic approach.Lastly, the suggested method's effectiveness was compared to that of different approaches (LACE result, logistic reconstruction, naïve bayes model, decision tree, and forward-looking neural networks) using the 5-fold cross-validation technique.

Minas Minoglou et al This study used multiple linear regression modelling and PCA (principal component analysis) to look at the relationship between the health care consumption of waste (HCWGR) and various socioeconomic and medical variables, including the difference in GDP per capita, medical expenses per person, the human growth index, life span during birth, mean duration of education, fatalities from tuberculosis, younger than five rate of mortality, hospital beds, better sanitation, nurses, doctors, and midwives and other diabetes prevalence, deaths from malignancy, fatalities from allergies, fatalities from the influenza virus, and influenza, along with one environmentally responsible factor, greenhouse gas emission levels, to 41 nations. A geographic categorization in the HCWGR was also done, and the Pearson relationship values for each comparison pair were computed.

The dangerous and sanitary fractions of healthcare waste (also called HCW are included in the HCWGR that was analyzed.
AnangSuryana et al The purpose of this research is to examine the effects that people, organizations', information technology, and regulations have on benefits—either entirely or in part. This study employs qualitative methods and is causation explanatory in nature. Analysis using multivariate regression methods is the method employed. The RSPI Prof. responders participated in this study as respondents. The main factor influencing the advantages of adopting SIMRS is regulations. In this instance, the hospital is required by law to hire a competent programmer who is familiar with all of the institution's business operations rather than to replace the developer. This is particularly relevant with regard to regulations. It is possible for future researchers to examine the impact of additional factors on rewards as well as the effects of comprehension and regulatory factors, should they turn out to be intermediary variables.
Javeed, A et al To anticipate cardiac failure, academics have developed a number of computerized diagnostic tools using data extraction & machine learning methods. On the other hand, cardiac death in patients' prediction has not received significant interest from scientists. To solve this issue, we created a system that supports clinical decisions for heart fatality prediction. The set of data, which included 368 sample overall and 55 characteristics, was gathered for the suggested model's practical goals. The data collection's categories were extremely unbalanced, as we discovered. We employed the artificial minority over sampling method (SMOTE) to get around the bias issue in a machine learning model.

Table 1 Summary of the literature review

Authors	Methodology	Parameters
R. Andrew Taylor et al [1]	CDRs and traditional analytic methods using the prediction of sepsis in-hospital mortality as the use case.	To reduce overfitting, the decision tree was pruned based on cross-validated error results using the complexity parameter associated with minimal error.
Dr. Krishan Kumar Goyal et al [2]	model using a correlation-based feature selection (CFS) method.	the parameters of genetic algorithms were established with trial and error for the presented operational and financial healthcare dataset.
HarikumarPallathadka et al [3]	The Nave Bayes method is a generative model, whereas kNN and SVM (Radial Bias and Polynomial)are discriminative models.	This classifier predicts the distribution of parameters based on the autonomy assumption.
Sanjeev Kumar et al [4]	Machine learning algorithm Location-based e-prescribing, e-reports, disease prediction, treatment suggestions	Five major components of e-healthcare system Location -based e-prescribing, e-reports, disease prediction, treatment suggestions
Woo Suk Hong et al [5]	Logistic regression (LR) Gradient boosting (XGBoost) Deep neural networks (DNN)	972 variables extracted per patient visit Models trained on increasing fractions of data for performance evaluation
Abdullah Ayub Khan et al [6]	Hyperledger Fabric machine learning (N gram)-enabled drug related information management and recommendation system for medical industries	where$m$ is the parameter that is used to tune $Q(m)$ for estimate minimization, every individual summed function is associated with the j-th observation.
Vivekanandan Thanigaivasan et al [11]	Parallel support vector machine (PSVM) Execution on multiple clusters with data partitioning and combination approach	PSVM with efficient time complexity Large memory requirement for big-data processing
T Verplancke et al [12]	variables were included for comparison between MLR and SVM.	The SVM with a Gaussian kernel function has two such training parameters:
Minas Minoglou et al [16]	In most cases, it was clear that HCWGR included both hazardous and non-hazardous fractions.	the coefficients between CANC and HE and ASTH, the correlation coefficients between the HB and HCWGR, GDP, HE, DTUB and ISF and the values between the DIAB
AnangSuryana et al [17]	HOT-Fit model used to measure effectiveness and efficiency. Six stages: literature study, modeling, mapping, data collection, scoring.	Validity of variables: Human, Organization, Technology, Net benefit tested. F test results: Human, organization, technology collectively significant for net benefit.
Javeed, A et al [18]	methods, such as Naive Bayes (NB), decision tree (DT), K-nearest neighbor (kNN), and genetic algorithm (GA)	we used a random forest classifier (RF), fine-tuning the hyperparameters of the RF using the grid search algorithm

3. Proposed methodology

The objective of this paper is to assess and examine the hospital's gender-specific death rates. The hospital's Hospital Management (HM) project evaluates and analyzes the mortality data for men and women. Data on admissions and deaths at Hero DMC Heart Institute are assessed for 2017. Analysis is done on the days of admission as well as the death rates for men and women. The proposed system of hospital management is shown in the Figure 2.

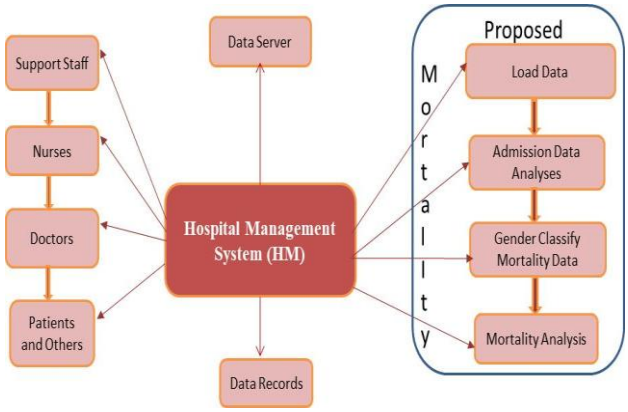


Figure 2 Prosed HM systems and mortality analysis

4. Results of Mortality analysis for HM

In this paper a case study of the mortality rate analysis is preseted for the project of the HM. The results of the data analytics is presented in the paper.

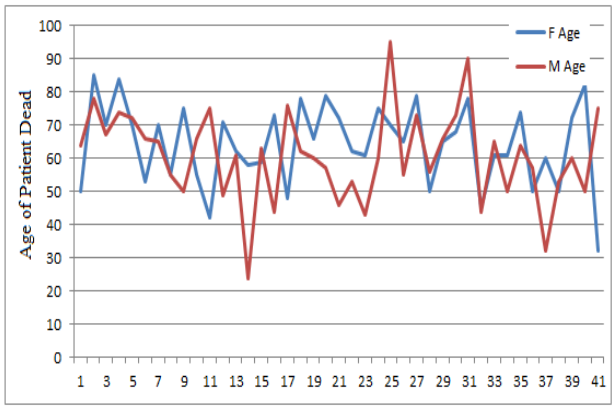


Figure 3 the Age of mortality for respective male and females

The comparative data analysis for the mortality age for the male and female gender vise is shown in the Figure 3. It can be clearly observed from the Figure that average age of the male mortality for the heart hospital is lower than the average Females mortality age.

The graphical bar chart representation of average mortality age for Male and females are shown in the Figure 4. The 4 year higher average age is there for the females on males

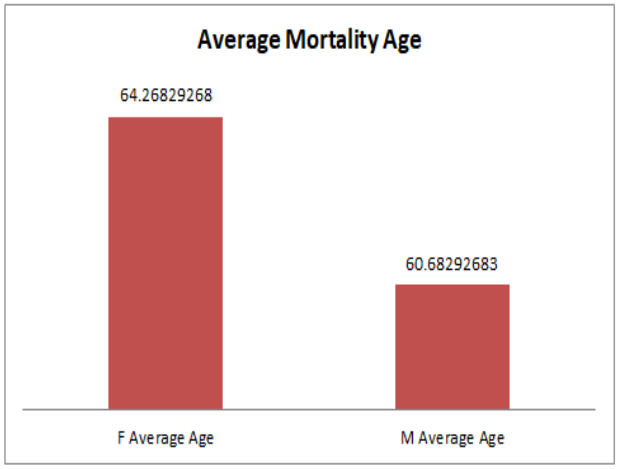


Figure 4 average mortality age of the male and female mortality

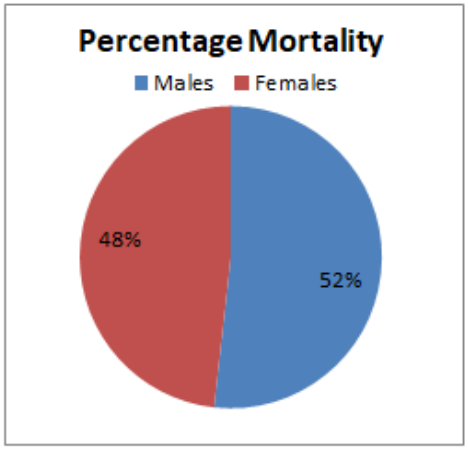


Figure 5 the percentage gender vise mortality rate calculated statistically

The average mortality rate analysis for the males and females are presented in the Figure 5. It can be observed that 4% less females are died compared to the males.

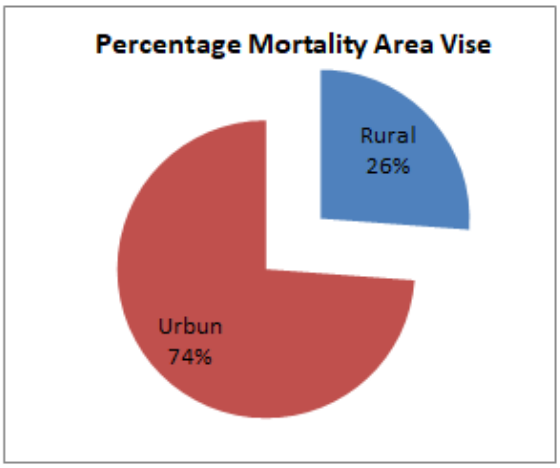
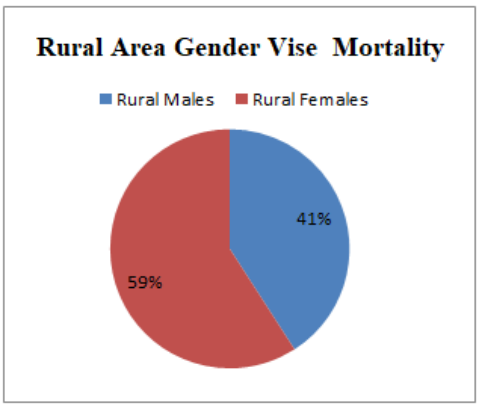
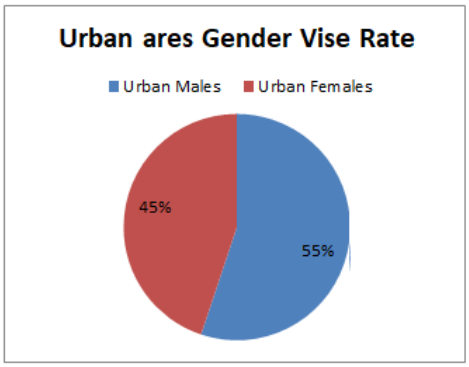


Figure 6 Mortality rate for urban and rural area vise

As an smotherstatistical data is compared for the mortality rate gender vise for the Rural and Urban areas as shown in Figure 7 a) and b) it can be clearly b=observed that more males are died in urban areas while the females ratio is more in the rural area



a) Gender vise rate for rural areas



b) Gender vise rate for Urban areas

Figure 7 area vise gender mortality rates comparison

5. Conclusion and future scopes

Evaluation and analysis of the hospital's gender-specific mortality rates are the goals of this work. For the hospital's Hospital Management (HM) initiative, the mortality data for men and women is assessed and examined. The Hero DMC Heart Institute's 2017 admissions and mortality statistics are assessed. The analysis includes days of admission as well as male and female mortality.

It is concluded that the 4 % more males have died compared to Females and also the average age of mortality for males is also 4% less than the females.

It is concluded that urban area have more mortality rate then the rural areas, It may be due to the location of the hospital in urban area and may be due to higher admissions ratio of urban patient then rural patents.

It can be clearly observed that more males are died in urban areas while the female's ratio is more in the rural area

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