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№ 871

Data analysis and classification of cardiovascular disease and risk factors associated with it in India

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April 1, 2019

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Abstract -Cardiovascular disease (CVD) is one of the genuine reasons behind mortality in India and around the globe. A high measure of sodium, high circulatory strain, extend, smoking, family parentage and a few different variables are related to heart illnesses. Air and Noise Pollution is also worst in India and is likely to cause more deaths, amongst the top five causes of deaths worldwide, are the heart, COPD, lower respiratory infections, and lung cancer. In India absence of information, and treatment facilities in that of rural and urban zones are the critical issue of concern. Youths have more chances of getting impacted with CVD, due to alcohol usage, smoking, and unfortunate eating routine. In the future, in India by 2030, the prevalence rate might rise to two-fold than 2018. This overview goes for researching progressing propels in understanding the investigation of infection transmission of CVD, causes and the hazard factors related to it.

Keywords - India, Ordinariness, Rate, Mortality, CVD, Smoking, Hypertension, Medicines, Diet and Nutrients, Air pollution, Data Analysis

1 Introduction

Cardiovascular disease (CVD) addresses 3C, viz., - Coronary, Cardiomyopathy, Congenital, Vascular-Diseases). As the term appears, it is a disorder of heart and veins. It is one of the real reasons for mortality in India and around the world. Not very many individuals know about the way that the use of tobacco, alcohol usage, overweight; forcefulness and deficient eating routine with the high proportion of salt are related to hypertension, which is otherwise called High Blood Pressure and is the significant hazard factors related with coronary heart disease [1]. It is continuously fundamental in most established women's as they enter menopause [2]. Most impacts in India are because of desperation, non-appearance of learning, treatment workplaces, and early start of ailment which has affected both urban and provincial areas [3]. The impact of high danger lead with diabetes, hypertension, smoking between the age of 35 and 70 and the absence of treatment is a real reason for CVD in India [4]. 33% of the affliction is a direct result of tobacco use, physical inertness, high-risk sexual practices, harm, violence and diverse factors in the early enhancement periods of youth, adding to the threat of perpetual sickness [5] In United Kingdom demise among south Asians is generally likely due to CVD. Smoking, circulating strain, corpulence, and cholesterol level additionally shifts between European and South Asian People. When contrasted with Europeans, South Asians have been found to have fewer coronary vessels and angiography has uncovered it to have a triple vessel illness, alongside a few lesions [31]. 70% populace lives in India in the provincial region and it needs restorative offices, delay in treatment as inaccessibility of specialists and less healing facility is also a big concern [39].

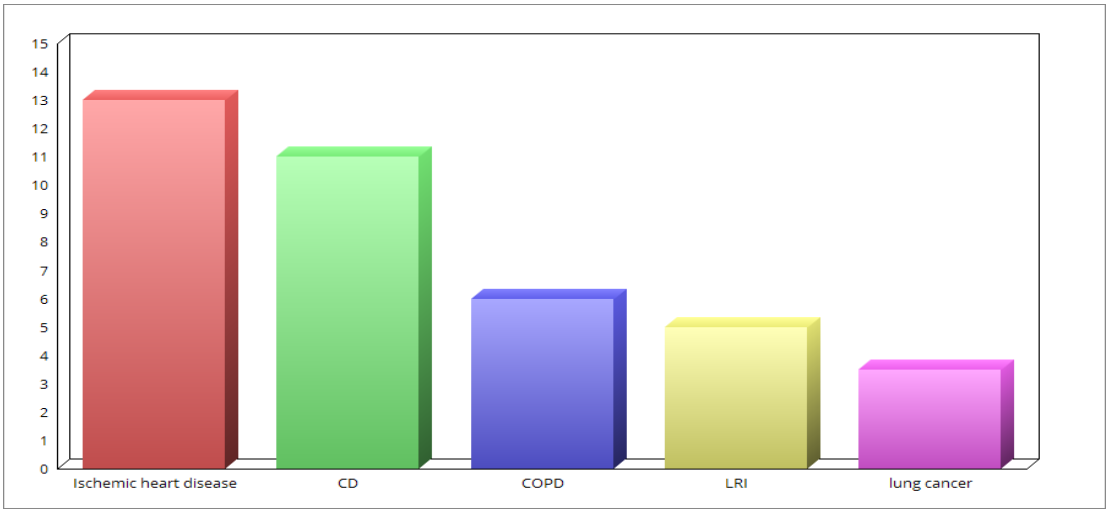

Fig. 1. Causes of death worldwide in 2015 [40]

Distress considering strain is seen to be ordinary among progressively prepared women and increasingly young woman inferable from smoking, fast sustenance's, and alcohol uses in European countries. They are at high risk of coronary artery disease [2]. About 52% of individual dies in India at age under 70 years, due to CVD [6] and investigation done in 1995-1996 and 2004 showed most extreme instances of people in a specialist treatment has expanded for diabetes, trailed by wounds, coronary illness and dangerous development in 2004 [7]. Diabetes relates to risk parts of CVD and has diminished future [8]. In May to October 2012, most of the patients in Odisha essential social insurance office were encountering respiratory (17%) and cardiovascular sickness (10.2%) [9]. Approx. Around 6 million people are continuing, and 610,000 individuals kicked the bucket each year in the United States due to coronary sickness, in 2009 the passing rate of men was more when contrasted with women's [10]. In a 2012-2014 study, information gathered from 400 Urban and 400 rustic houses from western India revealed nonappearance of preparing for prescription usage; for the most part, sedates used were cardiovascular affliction without medication and expiry dates and not suitable estimations being taken [11]. The acclaimed performing artist Abir Goswami and Razzak Khan passed on account of heart assault and cardiovascular catch which is caused by sudden frustration of flow of blood as heart stop to siphoning blood and its essential driver is Coronary Artery Disease (CAD) [12, 13].

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Dev Anand, Reema Lago, Vinod Mehra, Navin Nischol, Om Puri and Inder Kumar are some of the great personalities of Indian film Industry which died due to a heart attack [12, 13]

2 Prevalence and Mortality Rate

In September 2015 to July 2016 cross-sectional data shows most people affected by CVD were women being 56% more than men and prevalence rate of diabetes being 9%., for Hypertension prevalence rate was 22 %, hypercholesterolemia had a prevalence rate of 20%, and prevalence rate for previous and current smokers about 14% and 4% respectively [14]. In 2016 investigate done in the urban zone of Varanasi demonstrates that the predominance rate for hypertension was 32.9%, mean systolic and diastolic BP were 124.25 ± 15.05 mmHg and 83.45 ± 9.49 mm Hg. Men were more affected than women [1]. The regularity rate of hypertension among adults (>20 yr.) was 159 for each thousand for both Urban and Rural zone in 1995 [15]. In year 2009-2012 for each 20 urban networks Delhi, Karnataka (Bangalore, Mysore), Andhra Pradesh (Hyderabad, Vishakhapatnam), Maharashtra (Pune, Ambernath, Ahmednagar), Uttar Pradesh (Agra, Kanpur), Rajasthan (Jodhpur), Himachal Pradesh (Manali), Chandigarh, Uttrakhand (Dehradun, Mussourrie), Orissa (Chandipur), Assam (Tejpur), Jammu and Kashmir (Leh), Madhya Pradesh (Gwalior), Tamil Nadu (Chennai) and Kerala (Kochi) the general regularity for diabetes was 16% with little refinement in individuals approx. 16.6% and 12.7%, transcendence of hypertension was 21%, normality for dyslipidemia was high about 45.6%. The Men and Women are at high peril of CAD [3]. In 2010-2012, in Vellore, cross-sectional examination done by Rose angina survey and electrocardiography

found the inescapability rate for coronary Heart contamination among commonplace men was 3.4% and 7.3 % in urban men, in provincial women was 7.4 %, and 13.4%in urban women high among female than the male from prevalence rate drove between 1991-1994[16].

In 2010-2012, the cross-sectional survey shows prevalence rate increased in urban and rural area as compared to 1991-1994. The use of alcohol, overweight, raised blood pressure, smoking has put Delhi in high risk of cardiovascular disease. The mean body mass index in urban Delhi was found to be 24.4 to 26.0 kg/m2; and that in rural from 20.2 to 23.0 kg/m2), systolic blood pressure in urban was found to be 121.2 to 129.8 mm Hg, and in rural about 114.9 to 123.1 mm Hg), and diastolic blood pressure in urban was found to be 74.3 to 83.9 mm Hg; in rural about 73.1 to 82.3 mm Hg[17].

3 A rate of Cardiovascular ailment

In the year 2010-2011 sudden cardiac death at the age of 35 years and above of patients who underwent an autopsy, occurred in 39.7/100,000 of the population during the study interval. It was 4.6 times more in males than females with approx. incidence of 65.8/100,000 compared to 14.3/100,000 among females [21]. The incidence rate is 145 per 100 000 per year [22].

4 Spread of ailment with Age and beginning of ailment

Mean period of commencement of smoking in the urban and rustic region was 22.24±7.2 and 21.1±7.4[23]. Mean age at commencement of smoking in young person was 19 yrs. +/ - 2.34 years [[24]]. The mean age for sudden heart failure was observed to be 55 + 10 yrs. [21]

5 Risk Ailments of cardiovascular infirmities

5.1 **Smoking** - Tobacco is used in chewing, smoking by children at the age of 10-13 years, but found more in the age of 14-19yrs. According to world bank report, around 82,000 to 99,000 children smoke every day. Approx. 6 million people pass on overall on account of eating up tobacco and interfacing with smoke [25]. Tobacco used as cigarette contains chemical compounds, such as Acetone ((CH3)2CO) used in nail cleaning, Acetic Acid (CH3COOH) in hair shading, Ammonia (NH3) in cleaning house, Arsenic (As) as bug splashes and in rechargeable battery, Benzene(C6H6) as an essential part of gas, Butane (C4H10) which on reaction with plenty of oxygen forms Carbon dioxide and if oxygen is present in limited amount carbon monoxide is formed. Carbon Monoxide in car exhaust fumes, Hexamine in barbecue lighter fluid, Lead in batteries, Naphthalene as an ingredient in mothballs, Methanol in rocket fuel, Nicotine as an insecticide, Tar as material for paving roads, and Toluene, for making paint [26]. These synthetic compounds prompt swelling of a cell of veins making it confined and provoking various heart conditions, for instance, atherosclerosis in which cholesterol solidifies with other substance in blood making a plaque which blocks the stream of blood, and Abdominal aortic aneurysm in which stomach aorta is week's end and can prompt an aneurysm [27].

In India at the age of approx. 15 yrs. 47% men and 14% of women's either smoke or use tobacco as cigarette, beedis or hookah, chillum, and pipe, etc. [28]. In the year 2005, data from private and government schools of Noida shows prevalence rate between age 11-19 yrs. more in young men than young women. Early start of smoking or gnawing tobacco, among 70% young fellows and 80% young women starts at an age not actually or identical to 15 yrs., generally is found more in non-state funded schools than in government schools [29].

5.2 **Hypertension**- For CVD, hypertension is a most important risk factor which increases with age. The prevalence rate was found more in men as compared to a woman [20]

5.3 **Diet and Nutrition**- Low intake of fruits and vegetables and more intake of fast foods such as pizza, burger increases high blood pressure due to the presence of saturated fats and cholesterol which in turn forms a plaque in the wall of blood vessels causing the reduction in its diameter and elasticity [33].

5.4 **The abundance of Sodium**- Young, and grown-ups are more taking overabundance measure of salt into the body by eating various types of items bought from the market. As indicated by the World Health Organization (WHO) in 2003 <2.0 g/day of sodium taken by grown-ups which imply 5gm/ day and they are at high danger of hypertension [42,43]

5.5 **Air Pollution Effects**- India named as a seventh most polluted nation with regards to air pollution. The harmful gases mostly come from vehicles. Air contamination contains organic substances, particulate issue, and synthetic substances to the air which makes harm people and other living life forms [38]. Contaminated air has a negative influence on various organs. It ranges from minor upper respiratory, coronary illness, lung tumor and intense respiratory contaminations in youngsters and constant bronchitis in grown-ups, exasperating previous heart, and lung infection, or asthmatic assaults [45] This year 2018 before Diwali PM2.5 and NO_2 value have increased as compared to previous Diwali day in areas of Delhi Anand Vihar, R.K Puram, and Punjabi Bagh. These areas are quite unsafe for people to breath as they are more at risk in developing heart, COPD and cancer disease [44].

AQ1	Remark
0-50	Good
51-100	Satisfactory
101-200	Moderate
201-300	Poor
301-400	Very Poor
401-500	Severe

Table 1 The Remarks for AQI Index are given as below as taken from CPCB [44].

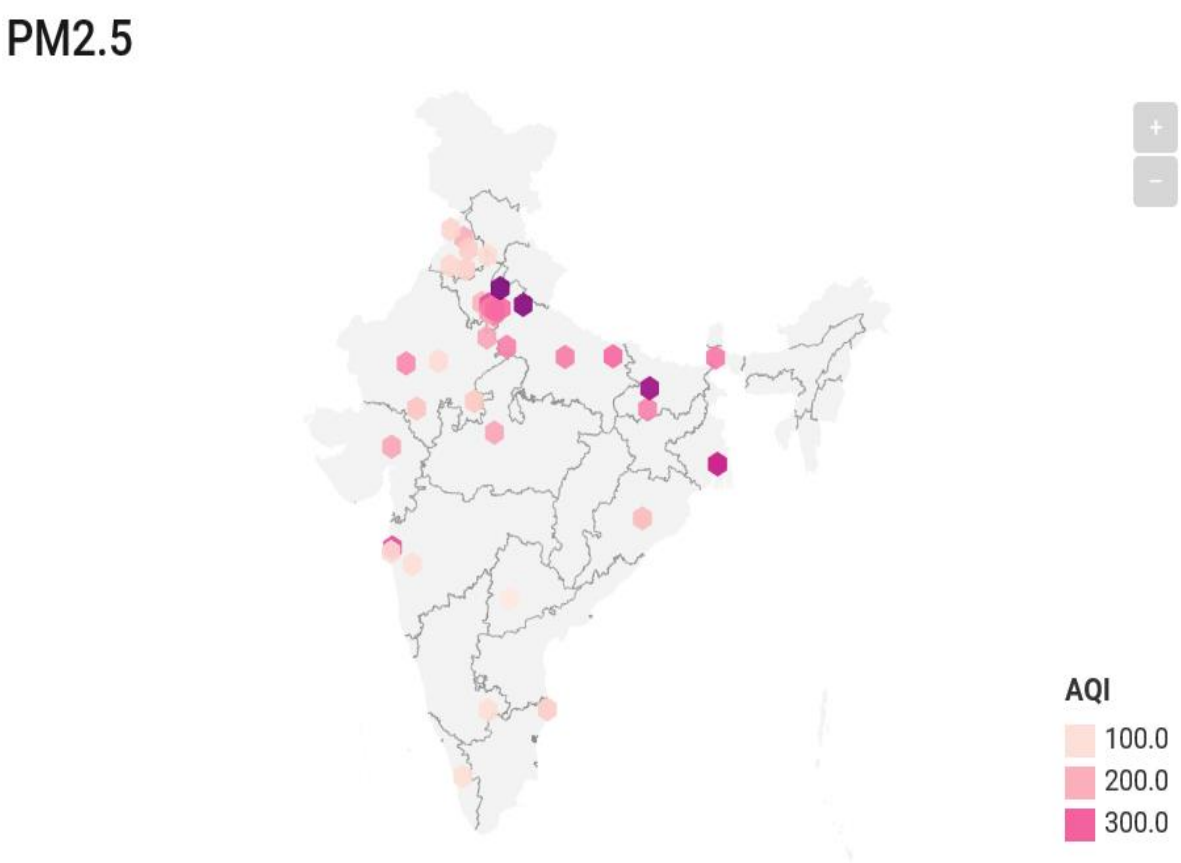

Fig. 2. India map showing AQI index on Diwali day 2018 [44].

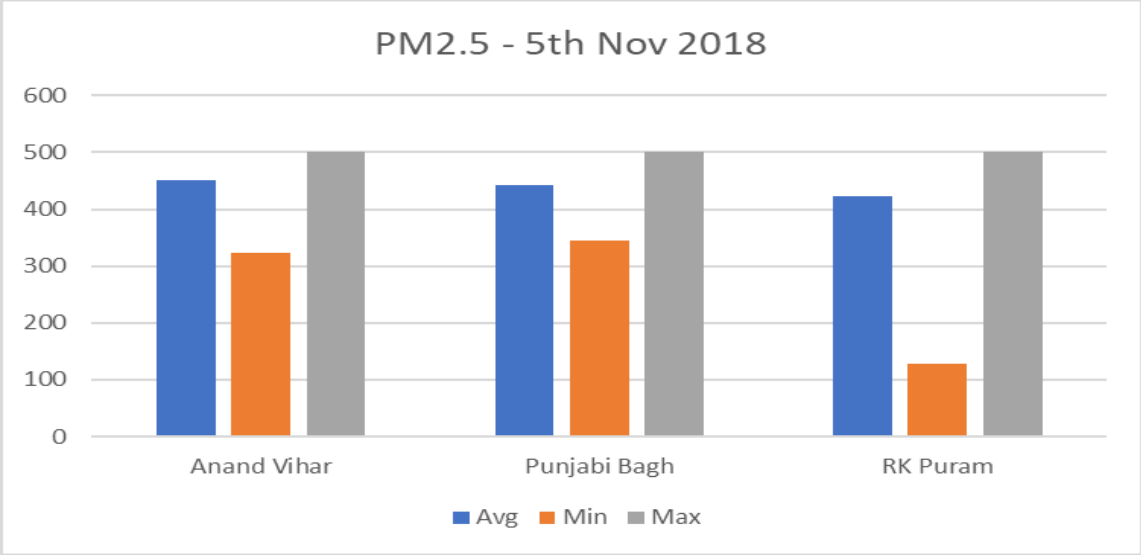

Fig. 3. PM2.5 value in Anand Vihar, Punjabi Bagh and RK Puram [44]

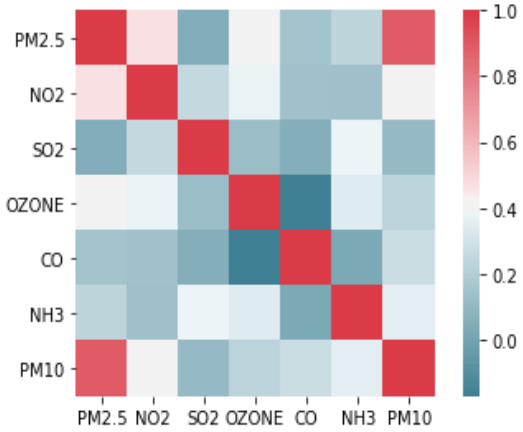

Fig. 4. The correlation coefficient for PM2.5 NO2 is 0.468688 and for that of PM2.5 and PM10 IS 0.8 [44]

5.6 **Gender** - Women's after their menopause is at high danger of creating cardiovascular sickness than young women's and men [46]. After menopause the cholesterol and low thickness lipoprotein (LDL) builds 10 to 14% while high thickness lipoprotein level stays unaltered, the low LDL and cholesterol can to some degree help in expanding the life expectancy in women [30].

5.7 **Ethnicity or race** - Ethnicity plays a role in CVD. South Asian have triple vessel infection as compared to European [31]

5.8 **Low financial status** - Utilization of Tobacco, low nourishment diet, and consumption of low-quality liquor is increasing in low financial status, although diabetes, hypertension is progressively normal [32]. Utilization of unsafe and low-quality liquor was found with low-salary and absence of training living in provincial territories [33]. Mental sickness, anxiety, was seen among individuals suffering from heart disease [34]. Patients enduring with mental clutters including Schizophrenia, serious mental confusion has 53% CVD [35].

5.9 **Psychosocial stress** - Youngsters are likely to be influenced by this issue mainly because of online networking sites like Facebook, Twitter, and so on. The absent of family support and that of luxurious living have great effects [33]. Stress may prompt hypertension, discombobulation, bitterness, and change in conduct. Patients experiencing these are bound to have heart disease [36]. Women's living in urban, provincial towns experience the ill effects of social factors and fears of sexual viciousness all of which adds to psychosocial stress [37].

6 Predictive Data Analysis of cardiovascular disease in an Urban and Rural area for Males and Females

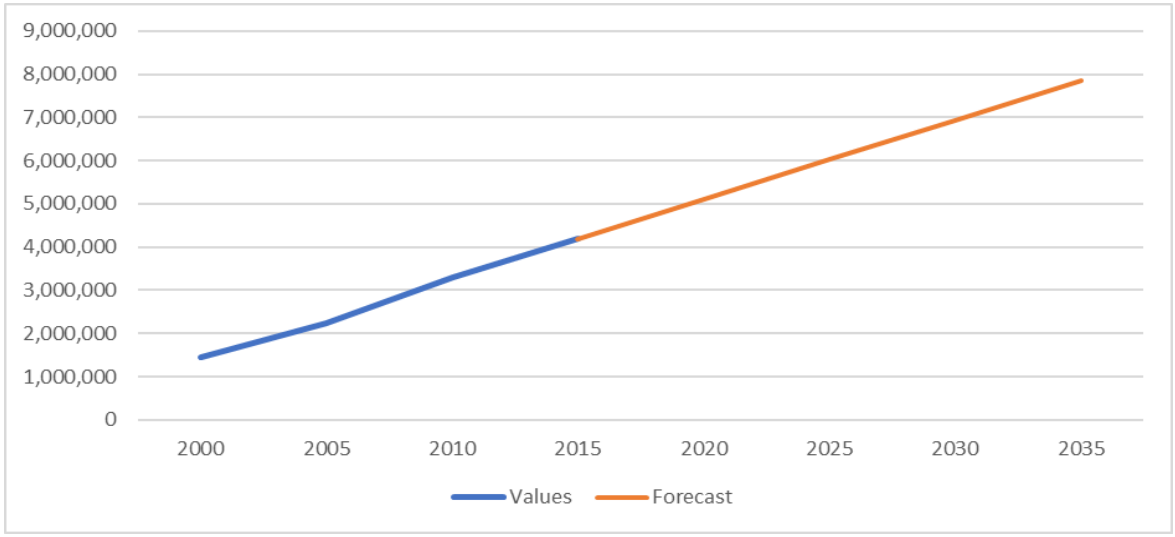

Fig. 5. Showing the Data Analysis in Urban area and likely to rise in 2030 in the age group 20-29 yrs. [40]

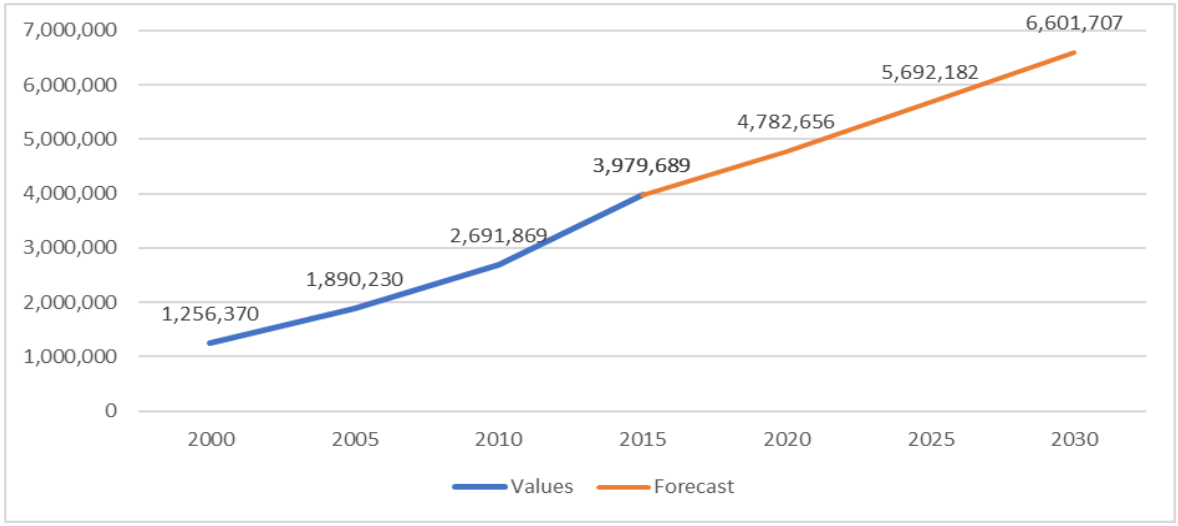

Fig. 6. Forecast data for the female in an Urban area for age 20-29 yrs. [40]

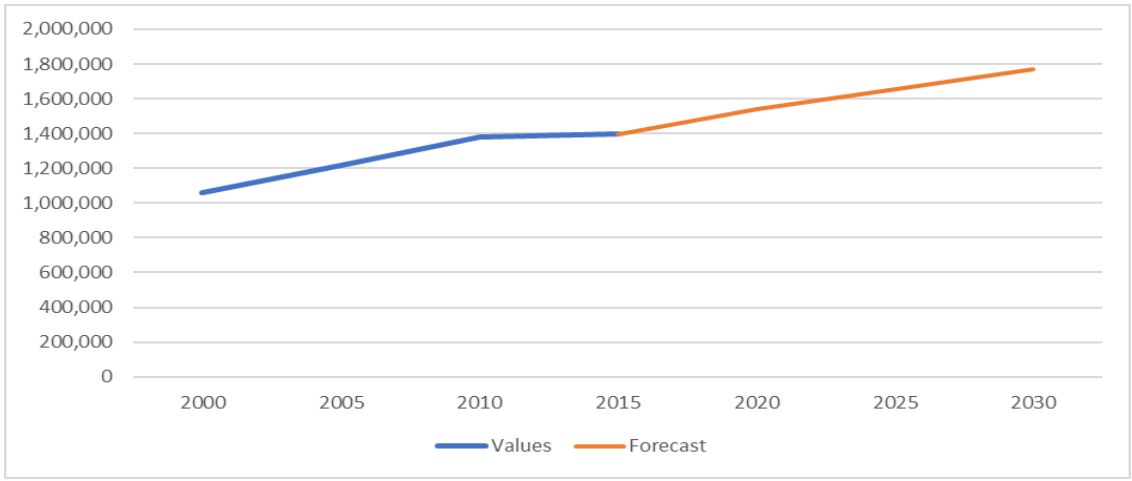

Fig. 7. Forecast data for the male in the rural area for age 20-29 yrs. [40]

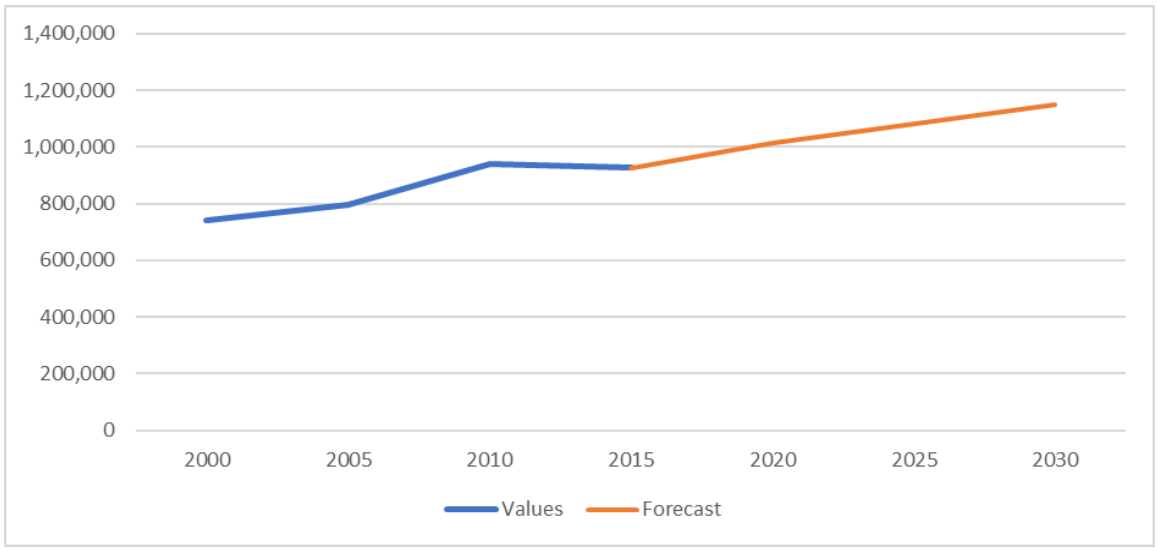

Fig. 8. Forecast for females in the rural area till 2030 for age 20-29 yrs. [40]

Predictive data analysis by excel shows rises in Urban and Rural cases for 2030 [40].

7 Classification of heart disease by Naive Bayes using Weka Tools

The dataset from GitHub was taken [46]. We used Weka Tools for the classification model for patients of heart and analyzed it by Naive Bayes classification algorithms as Naive Bayes Classification shows more accuracy than other algorithms. To test the developed model, we used 10-fold cross-validation. The outcomes can be used to make a control plan for Heart patients since Heart patients are regularly not recognized until a later phase of the ailment or the advancement of entanglements [47].

Time taken to build model: 0.01 seconds

Correctly Classified Instances	226	83.7037 %
Incorrectly Classified Instances	44	16.2963 %

Kappa statistic	0.6683	
Mean absolute error	0.1835	
Root mean squared error	0.3598	
Relative absolute error	37.163 %	
Root relative squared error	72.4003 %	
Total Number of Instances	270	

Table 2. Classification by Naïve Bayes Algorithm [47]

8 Conclusion

CVD is found to be the main reason behind more death in India and around the world. Ischemic coronary artery disease and stroke are the primary cause of about 70% of CVD deaths [6]. The knowledge of CVD and its hazard factors are considerably less in urban and rural zones along with the school children's. The family ancestors and ethnicity are additional factors in CVD. Young with family ancestry of smoking and diabetes have more chances of heart disease. Air pollution is also the biggest problem in India and is more in the three states Delhi, UP and Haryana. It is also one of the causes of respiratory, cardiovascular disease and skin cancer.

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