An Empirical Study on Current trends of Clinical Significance Approach to Heart Diseases Disorder

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Abstract:
Heart disease is the leading cause of deaths worldwide, though since the 1970s, heart mortality rates have declined in many high income countries. Heart disease is a broad term that includes all types of diseases affecting different components of the heart. Heart means 'cardio.' Therefore, all heart diseases belong to the category of cardiovascular diseases. In the world, India has one of the highest numbers of case related to heart diseases. According to the California-based CADI (Coronary Artery Disease among Asian Indians) Research Foundation, India will have 62 million heart patients by 2015. Many studies have examined the individual effects of smoking, physical inactivity, poor diet, and drinking alcohol, and have established that they are independently associated with poorer health. This study was conducted in Gujarat state to see the current trends of clinical significance approach to heart disease disorder.

Keywords: *Cardiovascular, Diseases, Health, Heart, Mortality*

1. Introduction

Heart disease is the leading cause of deaths worldwide, though since the 1970s, heart mortality rates have declined in many high income countries.

Heart disease is a class of diseases that involve the heart or blood vessels, that is, arteries, capillaries and veins. Heart disease refers to any disease that affects the heart system. Principally cardiac disease, vascular diseases of the brain and kidney and peripheral arterial disease. The causes of heart disease are diverse but atherosclerosis and orhypersystension are the most common.

2. Factors Responsible for Heart Disease

Heart disease is a broad term that includes all types of diseases affecting different components of the heart. Heart means 'cardio.' Therefore, all heart diseases belong to the category of cardiovascular diseases. In the world, India has one of the highest numbers of case related to heart diseases. According to the California-based CADI (Coronary Artery Disease among Asian Indians) Research Foundation, India will have 62 million heart patients by 2015.The most common cause of all heart diseases is the inadequate pumping of blood and oxygen from the heart to the rest of the body and vice-versa.

- Coronary heart disease (CHD) is also known as coronary artery disease, it is the most common type of heart disease across the world.
- Angina pectoris in a medical term for chest pain that occurs due to insufficient supply of blood to the heart. Also known as angina, it is a warning signal for heart attack.

- Congestive heart failure condition where the heart cannot pump enough blood to the rest of the body. It is commonly known as heart failure.
- Cardiomyopathy is the weakening of the heart muscle or a change in the structure of the muscle due to inadequate heart pumping.
- Congenital heart disease is also known as congenital heart defect, it refers to the formation of an abnormal heart due to a defect in the structure of the heart or its functioning.
- Arrhythmias are associated with a disorder in the rhythmic movement of the heartbeat. The heartbeat can be slow, fast, or irregular.
- Myocarditis is an inflammation of the heart muscle usually caused by viral, fungal, and bacterial infections affecting the heart.

3. Life Style Influence

Many studies have examined the individual effects of smoking, physical inactivity, poor diet, and drinking alcohol, and have established that they are independently associated with poorer health. However, few studies have examined the combined influence of these behaviours. This is important because people often engage in multiple poor lifestyle choices that could shorten their life span. "To fully understand the public health impact of these behaviours, it is necessary to examine both their individual and combined impact on health outcomes."

4. Eating Habits and Disorder

A person used to eat at home 2-3 times/day and because of rapid transformation in the lifestyle of Indians, particularly those living in urban India, has resulted in dramatic increase in the demand for processed food. The main reason why processed food is luring the urban Indians is the convenience that it offers to cooking, as they don't need to spend hours in kitchen to get that appetizing food. Growth in working women's population and prevalence of nuclear families with double income are other trends causing this change in the lifestyle of Indians.

Bad eating habits are common. It is easy to operate on automatic when it comes to food. Living in a fast-paced society often makes it so you have to eat on the run, skip meals, eat whatever is fast and easy or use food to relieve stress.

- **Eating on the Run**
  If you live a busy life, there may not be enough time to prepare meals or sit down to eat. Eating in the car or going through a fast food drive-thru may be part of your eating habits. The challenge with eating on the run is that you don't have a chance to pay close attention to what you're eating.
- **Eating Large Portions**
  As bad eating habits go, eating more food than the body needs is a common behavior. This can happen for a variety of reasons. If you're distracted by the television, you might eat more. Some people eat more when they're feeling lonely.
- **Using Food to Relieve Stress**
  Many people use food to relieve stress. After a long and difficult day at work, eating many slices of pizza and drinking beer may be an attractive option. Using food in this way, however, leads to greater weight gain. When feeling stressed out, find ways to relax yourself that don't involve food. Spending time in nature, talking with friends, meditating and exercising are a few options.
- **Skipping Meals**
  Many doctors and nutritionists will tell you repeatedly to avoid skipping meals. When you don't eat regularly, your hunger increases and you may also experience drops in blood sugar level. Many people compensate for this by eating larger meals later in the day or by excessive snacking. Be sure to eat breakfast, lunch and dinner every day.

- **Late Night Eating**
  Eating late at night is one of the bad eating habits is very common. Nighttime eating often consists of snacking and excessive calorie consumption. This may be due to boredom or being distracted by sedentary activities such as watching television or surfing the web. To avoid eating late at night, find interesting things to do that take away the boredom. Possible options may include a fun hobby, an interesting book, meditation, an exercise DVD or a conversation with a good friend.

5. Disorder – An Unavoidable Hereditary Problem

According to the American Heart Association, however, the capability of the body to resist a genetic predisposition to heart disease can be explained by lifestyle factors such as diet, exercise, avoiding chronically stressful conditions and smoking.

5.1 Stressful Life and Disorder

The stresses of life have long been thought to increase a person's risk of cardiovascular disease or a serious coronary or cerebral event. But it is not universally agreed which stress causes heart disease. In Australia, an expert group concluded that there is strong and consistent link between depression, social isolation and lack of quality social support and heart disease. These factors were as risky to heart health as abnormal blood lipid levels, smoking and high blood pressure.

5.2 Disorder due to class difference

Indian rural population and urban poor are facing a "double burden" – with incidences of acute diseases continuing, there has been a rapid growth in incidences of chronic diseases. Given the issues of affordability, accessibility, and quality of healthcare, mortality rates from heart diseases are much higher in the economically underprivileged population.

6. Review of Literature

6.1 A literature review of cardiovascular disease management programs in managed care populations

A total of 20 studies conducted in managed care populations were reviewed: 5 in patients with congestive heart failure (CHF), 9 in hypertensive patients, and 6 in hyperlipidemia and/or coronary artery disease (hyperlipidemia- CAD) patients. Management of CHF involved multifaceted programs that included the participation of multiple health care professionals, patient and physician education, promotion of intensive drug therapy and lifestyle modifications, and close patient monitoring. The most common CHF management strategies were case management and physician education, with an emphasis on close patient monitoring. Hypertension and hyperlipidemia-CAD intervention programs focused on chronic outpatient management and regular follow-up, with an emphasis on self-management skills. These programs were managed through regular and periodic interventions, including pharmacist-managed clinics and automated provider notices. Many of the studies employed "before-after" comparisons in the absence of a truly experimental design and posed significant limitations due to variations in the outcomes measured, lack of transparent disease severity stratification, and variation across types of managed care organizations.

6.2 A literature review of the cardiovascular risk-assessment tools: applicability among Asian population

Methods: A systematic search was performed using keywords as MeSH and Boolean terms.
Results: A total of 25 risk-assessment tools were identified. Of these, only two risk- assessment tools (8%) were derived from an Asian population. These risk-assessment tools differ in various ways, including characteristics of the derivation sample, type of study, time frame of follow-up, end points, statistical analysis and risk factors included.

6.3 Social support, depression, and heart disease: a ten year literature review

Method: PubMed and PsychINFO were searched for quantitative studies assessing the multiple effects of low social support and depression on prognosis outcomes in patients with heart disease. The following search terms were used: social relation*, cardiac disease, support quality, relationship, and relational support.

Results

Five studies (three prospective cohort studies, one case-control study, and one randomization controlled trial) were selected and coded according to the types of support (social and marital). The majority of findings suggest that low social support/being unmarried and depression are independent risk factors for poor cardiac prognosis. However, all analyzed studies have some limitations. The majority of them did not focus on the quality of marital or social relationships, but assessed only the presence of marital status or social relationship. Moreover, some of them present methodological limitations.

7. Research Objective

The purpose of Research is enlightenment and updating the knowledge for the area chosen. The scientific approach combined with systematic and planned academic activity is the purpose of research. It can be said that if the purpose or the objective of research is not clear, a person may not get the desired result or even that a person may get lost in the way without reaching destination. Defining the objective for Research is like becoming a traffic policeman on the middle of a heavy traffic road and making a sense by avoiding confusion.

1. To gain familiarity with a phenomenon or to achieve new insights into it (studies with this object in view are termed as *exploratory* or *formulative* research studies);
2. To portray accurately the characteristics of a particular individual, situation or a group (studies with this object in view are known as *descriptive* research studies);
3. To determine the frequency with which something occurs or which it is associated with something else (studies with this object in view are known as *diagnostic* research studies);

To test a hypothesis of a casual relationship between variables (such studies are known as *hypothesis-testing* research studies).

8. Statistical Analysis

8.1 People influenced with Heart Diseases & Disorder

In India, estimated people who are having heart diseases is around 25 lakhs with confidence interval of 18.3 to 29.4 lakhs for the year 2009. Children (<15 yrs) account for 3.4 % of all infections, while 82 % are in the age group of 15-49 years. Of all heart diseases, 38 % (9.2 lakhs) are among women. The four high prevalence states of South India (Andhra Pradesh-5 lakh, Maharashtra – 4.2 lakhs, Karnataka – 2.5 lakhs, Tamil Nadu – 1.5 lakhs) account for 55 % of all Heart infections in the country. West Bengal, Gujarat, Bihar and Uttar Pradesh are estimated to have more than 1 lakh patients each and together account for another 22 % of heart problems in India. The states of Punjab, Orissa, Rajasthan and Madhya Pradesh have 50,000 – 1 lakh heart diseases patients each and together account for another 12 % of heart problems. These states, in spite of low heart diseases, have large number of patients due to the large population size.

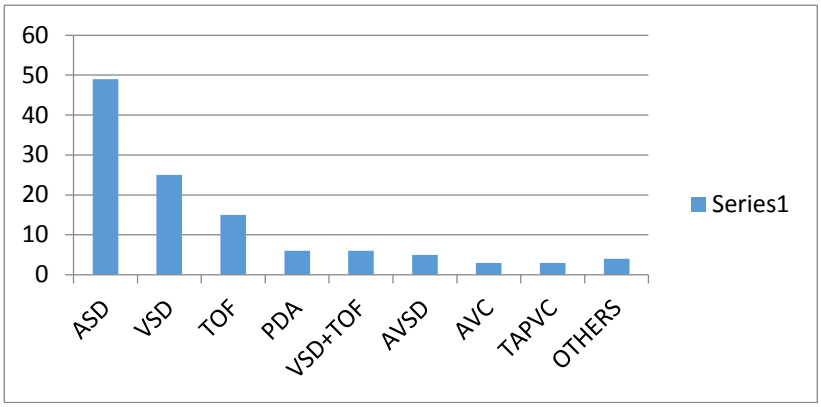
Congenital Heart Disease (CHD) refers to a problem with the heart's structure and function due to abnormal heart development before birth. Congenital malformations are the most common of all birth defects. CHD affects about 8-10 per 1000 live births and is a leading cause of infant mortality. The burden of CHD in India is enormous due to very high birth rate. This emphasizes the importance of this group of heart diseases. It is known that 180,000 children are born with CHD each year in India.

Approximately 10% of present infant mortality in India may be accounted for the CHD alone. Rapid advances have taken place in the diagnosis and treatment of CHD in last six decades. Due to the currently available sophisticated diagnostic tools, accurate diagnosis of CHD can be made even before birth. But, unfortunately this privilege of early diagnosis and timely management is restricted to children in developed countries only. There are still majority of CHD cases in a developing country like India due to lack of necessary care leading to mortality and morbidity.

There is relative importance of both genetic and environmental risk factors in the causation of CHD. However, the specific role played by each of the factors is still contradictory. **Environment** plays a significant role and constitutes about 1% in the causation of CHDs. It was hypothesized that environmental agents act on the individuals predisposed to the malformation and to the agent, and the exposure must occur at the vulnerable period of cardiac development several risk factors like **demographic, reproductive and factors in lifestyle or environment** have been proposed for CHD. There is mounting evidence that indicates that **advanced maternal age** has significant effect on the risk of CHD, though there are reports showing that young maternal age (<20 years) is also associated with a increased risk of CHD. Many studies have centred on paternal age as a risk factor for congenital cardiac defects in offspring and have showed varied results.

Among the CHD cases analyzed by Gujarat Government in 2010, 59 (53.63%) were females and 51 (46.36%) were males. The age range was 5 to 47 years and the mean age was 19.08 years. Among the CHD cases 49 (44.54%) had atrial septal defect, 25 (22.72%) had ventricular septal defect, 15 (13.63%) had tetralogy of fallot, 6 (5.45%) had patent ductus arteriosus, and 15 (13.63%) had other types of CHDs (Fig. 1). The assignment and proportion of potential risk factors for CHDs in the population are listed in Table 1.

The mean maternal age at pregnancy was 23.07 years (standard deviation [SD] ±5.52) and mean paternal age at pregnancy was 27.51 years (standard deviation [SD]±6.52). There were 29.09% CHD cases with birth weight <2.5 kg with mean birth weight of the subjects being 1.29 kg (standard deviation [SD] ±0.457). The percentage of cases with 1st, 2nd, +3rd birth order were 38.18, 23.63 38.18% respectively. Consanguineous marriages were prevalent in 26.36% of our study subjects. Socio-economic status of the family was also taken into account and was categorized as low (56.36 %), middle (43.63%) and high (0%). There was 19.09% cases in which history of inherited disorders was reported in the family. Our study consisted of cases of teratogenic exposure also among which 11.81% cases were of maternal exposure to therapeutic drugs, 7.27% cases of maternal illness (fever and cold) and 20% cases of maternal infection (upper respiratory tract infection).



Risk factor analysis: As shown in Table 2, with respect to demographic factors maternal age ($p<0.001$) and paternal age at pregnancy (0.001), birth weight of the individual ($p<0.001$) and birth order ($p<0.001$) were found significantly associated with CHD. Though gender of the individuals

was not found associated with the risk for CHD as there was no significant difference ($P^2 = 0.0183$, $p = 0.892$) in the number of males and females that participated for the study, both in cases and controls. CHD cases had an almost even distribution as regards their residences, while controls showed a predominance of urban residence over the rural one. Socio-economic status of the family was found to be significantly associated with the causation of CHDs ($P^2 = 96.568$, $p<0.001$).
The average inbreeding coefficient was higher in families of cases (0.33) compared to the families of controls (0.018), there was significant difference between the cases and controls as regards the proportion of consanguineous marriages ($P^2 = 33.403$, $p<0.001$). Thus, risk factors for CHDs, such as maternal age ($p<0.001$) and paternal age (0.002) at pregnancy, birth weight ($p<0.001$), birth order ($p<0.001$), consanguineous marriages ($p<0.001$), family history of inherited disorders ($p<0.001$), paternal residence ($p<0.001$), socio-economic status of the family ($p<0.001$), maternal therapeutic drug exposure ($p<0.001$), maternal illness ($p<0.001$), maternal infection ($p<0.001$) were found significantly associated with CHDs while gender ($p = 0.892$) was not significantly associated with CHD, were identified by univariate analysis.

Multivariate logistic regression analysis followed the univariate analysis to assess the significant risk factors for developing any type of CHD in our study population. Case-control status was used as the dependent variable and maternal and paternal age at pregnancy, gender, birth weight, birth order of child, consanguineous marriages, family history of the disease, maternal therapeutic drug exposure, maternal illness, maternal infection, socio -economic status of the family ($p<0.001$), maternal therapeutic drug exposure ($p<0.001$), maternal illness ($p<0.001$), maternal infection ($p<0.001$) were found significantly associated with CHDs while gender ($p = 0.892$) was not significantly associated with CHD, were identified by univariate analysis.

Table 1: Risk Factor exposures among cases and controls

Risk factor	CHDs	Controls	Risk factor	CHDs	Controls
Maternal age range at pregnancy (years)			**Paternal age range at pregnancy (years)**		
<20 years	25.45*	4.54	<20 years	0	0
20-29	57.27	89.09	20-29	69.09	87.27
30-39	15.45	5.45	30-39	23.63	10.90
>39 years	1.81	0.90	>39 years	7.27	1.8
Socio-economic status Birth Order					
Low	56.36	0	1	38.18	74.54
Middle	43.63	83.63	2	23.63	23.63
High	0	16.36	3+	38.18	2.72
Family inherited disease history maternal drug exposure					
Yes	19.09	0	Yes	11.81	0.9
No	80.90	100	No	88.18	99.09
Consanguinity Maternal illness					
Yes	26.36	1.81	Yes	7.27	1.81
No	73.63	98.18	No	92.72	98.18
Gender Maternal infection					
Male	46.36	46.36	Yes	20	0
Female	53.63	53.63	No	70.90	100
Birth weight paternal residence					
<2,500 g	29.09	3.63	Urban	59.09	80.90
2,500 g	70.90	96.36	Rural	40.90	19.09

Table 2. Details of contingency analysis of various risk factors in CHD in Vellore population

Variables	Cal. P^2 Value	df	Significance
Maternal age at pregnancy§	25.143	1	p<0.001*
Paternal age at pregnancy§	10.168	1	0.001*
Birth weight	25.473	1	p<0.001
Birth order	25.191	1	p<0.001
Consanguinity	33.403	2	p<0.001
Family history	21.058	1	p<0.001
Maternal drug exposure	11.773	1	p<0.001
Maternal illness	6.356	1	0.012*
Maternal infection	22.273	1	p<0.001
Socio-economic status	95.568	2	p<0.001
Gender	0.0183	1	0.892**
Paternal residence	11.450	1	p<0.001

*: Significant at p<0.001, **: Non-Significant
Factors reassigned after function transform of the discrete ranked variables,
0: <20 or $35 years, 1: 20-35 years of maternal and paternal age

Table 3. Logistic Regression analyses of case-control study of CHD patients

	Multivariate analysis			
Variable	Coefficient ($)	p-value	odds	ratio (95% CI)
Maternal Age at pregnancy	1.447	0.068*	4.251	(0.899; 20.105)
Paternal Age at pregnancy	2.48	4 0.008	11.994	(1.921;74.873)
Birth Weight	- 2.478	0.003	0.0839	(0.0159;0.443)
Birth Order	1.367	0.028	3.925	(1.158;13.309)
Consanguinity	- 21.626	0.997	----	------
Family History**	- 19.761	0.997	----	-------
Maternal Drug Exposure	- 20.795	0.999	0.0264	(0.00161;0.431)
Maternal Illness	- 0.705	0.666	0.494	(0.0201;12.116)
Maternal Infection**	- 19.986	0.997	----	-------
Gender	- 0.0201	0.973	0.980	(0.307; 3.131)
Socio-economic Status**	21.101	0.995	----	-------
Paternal Residence	1.685	0.008	5.392	(1.565;18.572)

*: p<0.05; CI, Confidence Interval, **: Odds ratio are not shown if the 95% CI are extremely wide

The regression coefficients ($) for maternal age and paternal age at pregnancy was 1.447 and 2.484 respectively, which implies that age of the mother and Table 1: Risk Factor exposures among cases and controls.

Father at the time of pregnancy had a positive impact on the occurrence of CHD in our study and was significant at p = 0.05. The odds ratio for maternal and paternal age (i.e., <20 and $35 years) at pregnancy were 4.251 and 11.994, respectively that indicates that both maternal age and paternal age at pregnancy increases the risk for CHD in the the population by 4.251 and 11.994 times the maternal and paternal age between 20-35 years. The regression coefficient ($) and odds ratio for birth weight were -2.478 and 0.0839 respectively, which has significantly (at p = 0.05) negative

impact on CHD. The regression coefficient ($) and odds ratio for birth order (birth orders > 1) of cases was 1.367 and 3.925 respectively, which significantly increases the risk of CHD by 3.925 times the normal birth order (birth order. Paternal residence (rural) had a regression coefficient ($) of 1.685, which implies that it strongly influences the occurrence of CHD in our study and was significant at p = 0.05. It had an odds ratio of 5.392 that indicates that there is 5.392 times more risk of occurrence of CHD in the case of rural residents than the urban. Thus in multivariate analysis, paternal residence, maternal and paternal age at pregnancy, birth weight and birth order of the individual was only statistically significant risk factors for CHD.

9. The Primary Causes for Heart Diseases in India

Intensive lifestyle changes (10% fat whole foods vegetarian diet, aerobic exercise, stress management training, smoking cessation, group psycho- social support) for 5 years or more may lead to serious heart problems, is the fact established by Gujarat Government Hospital based data.

The data collected from various Journals are the hospital based data that maintains that health awareness programmes have greatly contributed to the control and reduction of heart diseases in India. The hospital based data states that the selected patients were given life-style awareness tips and were given the right kind of environment to rigorously follow the schedule as per medical examination. The group that was selected for the purpose was named as Experimental Group. The experimental group patients (20 [71%] of 28 patients completed 5-year follow-up) made and maintained comprehensive lifestyle changes for 5 years, whereas control group patients (15 [75%] of 20 patients completed 5-year follow-up) made more moderate changes. In the experimental group, the average percent diameter stenosis at baseline decreased 1.75 absolute percentage points after 1 year (a 4.5% relative improvement) and by 3.1 absolute percentage points after 5 years (a 7.9% relative improvement). In contrast, the average percent diameter stenosis in the control group increased by 2.3 percentage points after 1 year (a 5.4% relative worsening) and by 11.8 percentage points after 5 years (a 27.7% relative worsening) (P = .001 between groups. Twenty-five cardiac events occurred in 28 experimental group patients vs 45 events in 20 control group patients during the 2-year follow-up (risk ratio for any event for the control group, 2.47 [95% confidence interval, 1.48-4.20]).

More regression of coronary atherosclerosis occurred after 2 years than after 1 year in the experimental group. In contrast, in the control group, coronary atherosclerosis continued to progress and more than twice as many cardiac events occurred.

THE LIFESTYLE Heart Trial was the first randomized clinical trial to investigate whether ambulatory patients could be motivated to make and sustain comprehensive lifestyle changes and, if so, whether the progression of coronary atherosclerosis could be stopped or reversed without using lipid-lowering drugs as measured by computer-assisted quantitative coronary arteriography. This study derived from earlier studies that used non-invasive measures.

After 1 year, we found that experimental group participants were able to make and maintain intensive lifestyle changes and had a 37.2% reduction in low-density lipoprotein (LDL) cholesterol levels and a 91% reduction in the frequency of anginal episodes. 3

Average percent diameter stenosis regressed from 40.0% at baseline to 37.8% 1 year later, a change that was correlated with the degree of lifestyle change. In contrast, patients in the usual-care control group made more moderate changes in lifestyle, reduced LDL cholesterol levels by 6%, and had a 165% increase in the frequency of reported anginal episodes.

Average percent diameter stenosis progressed from 42.7% to 46.1%. The technicians responsible for performing all medical tests were blinded to patient group assignment. Also, different personnel

implemented the lifestyle intervention, conducted the tests, and computed statistical analyses, although the dietitian was made aware of the nutrient analysis to monitor patients' safety and adherence. Quantitative coronary arteriograms were blindly analyzed without knowledge of group assignment.

Table 4. Descriptive Statistics of data collected for Male [N=61] and Female [N=49]

Variables	Min [Male]	Min [Female]	Max [Male]	Max [Female]	Mean [Male]	Mean [Female]	SD [Male]	SD [Female]
Age	15	15	65	60	42.34	32.51	14.608	12.762
Height	143	140	178	170	163.31	152.29	6.862	6.400
Weight	29	30	81	80	55.62	45.47	11.715	10.190
Body Mass Index	10.65	11.02	29.75	29.38	20.4308	16.7013	4.30299	3.74291
Waist Circumference	57	55	105	100	77.30	70.14	12.434	10.634
Systolic Pressure	90.00	90.00	170.00	140.00	124.3279	114.6939	14.87360	9.81114
Diastolic Pressure	70.00	70.00	100.00	100.00	79.4426	75.1020	6.99649	7.39438

10. Statistical Analysis

As mentioned in the starting of the chapter let us discuss some statistical tests performed on various secondary data especially available for Gujarat State and India The following Hypotheses are tested by using chi-square test and proportion test:

1. Subgroups of Heart Diseases population and different age groups are independent in terms of positivity of Heart Problems.
2. Subgroups of Heart Disease population and different levels of literacy are independent in terms of positivity of Heart problems.

After all tests analysis some figures/graphs are discussed related with the various indicators of the Heart Problems.

Test 1

H_o: Subgroups of Heart Diseases population and different age groups are independent in terms of positivity of Heart Problems.

To test this data is taken from Annual Health Report-2011 of Gujarat State which was prepared by Gujarat State Heart and Health Awareness Group. The data used is given below:

Particulars	Genetic Factors			Diabetes			Hypertension		
	Sample Patients (Number)			Sample Patients (Number)			Sample Patients (Number)		
Age Group	Tested	Affected	%	Tested	Affected	%	Tested	Affected	%
Below 20	78	5	6.41	23	0	0.00	9	0	0.00
20-29	1030	46	4.47	521	31	5.95	319	7	2.19
30-44	547	35	6.40	883	21	2.38	165	2	1.21
>45	70	6	8.57	67	4	5.97	7	0	0.00
Missing	7	1	14.29	0	0	0.00	0	0	0.00

From the above data the table showing **observed frequencies (O)** are given below:

Age-Group	**Genetic Factors**	**Diabetes**	**Hypertension**	**Total**
Below 20	6.41	0.00	0.00	6.41
20-29	4.47	5.95	2.19	12.61
30-44	6.40	2.38	1.21	9.99
>45	8.57	5.97	0.00	14.54
Missing	14.29	0.00	0.00	14.29
Total	40.14	14.30	3.40	57.84

Now for each cell of the above table corresponding expected frequencies (E) are calculated as follows:

Expected Frequency = $\frac{\text{Row Total x Column Total}}{\text{Grand Total}}$

The table showing expected frequencies (E) for each cell is given below:

Expected Frequency (E)

Age-Group	Genetic Factor	Diabetes	Hypertension
Below 20	4.448	1.585	0.377
20-29	8.751	3.118	0.741
30-44	6.933	6.933	2.470
45 and above	10.091	3.595	0.855
Missing	9.917	3.533	0.840

Now, x^2 test statistic is obtained

$x^2 = \sum \frac{(O-E)^2}{E} = 19.98$

Here p-value = 0.010394 and for (5-1) x (3-1) = 8 d x f_1 $x^2 = 15.51$

So we can see that $x^2 > x^2$

So, we can conclude that the subgroup (i.e. Genetic factor, Diabetes, Hypertension) and age are not independent. Therefore from the available sample data we can see that in the subgroup. Heart disorder is more in older people whose age is more than 45 than any other age group. Further, it can be seen that, the heart diseases is maximum in the age group 20-29 for Diabetes subgroup and Hypertension subgroup.

The conclusion is suggestive that older people tend to be affected by such factors more than genetic influences.

Test 2

H_o: Sub groups of Heart Disease population and different levels of literacy are independent in terms of positivity of Heart problems. Using the data given in Test 1, the observed frequencies (O) are given below:

Observed Frequencies (O)

Particulars	**Genetic Factors**	**Diabetes**	**Hypertension**
Illiterate	4.60	4.43	0.00
Literate till 5th	5.24	2.99	1.85
Till 12th	5.64	3.61	2.02
Till Graduation	7.14	0.00	0.00
Graduation & above	3.57	11.03	3.87
Total	26.19	11.03	3.87

The corresponding Expected frequencies (E1) are shown in the following table.

Expected Frequencies (E_1)

Literacy	Genetic Factors	Diabetes	Hypertension
Illiterate	5.756	2.424	0.850
Literate to 5th	6.425	2.706	0.949
Till 12th	7.183	3.025	1.061
Till Graduate	4.551	1.917	0.672
Graduate & Above	2.275	0.958	0.336

Now, $x2 = \sum (0 - E)2 = 11.25$ E

Here, p-value = 0.188001 and for (5-1)x (3-1) = 8d x f x x2 = 15.51

So, we can see that x2 < x2

So, we can conclude that the subgroups (i.e. Genetic Factors, Diabetes and hypertension) and literacy levels are independent. It means that literacy levels and subgroups are independent in terms of positivity of Heart diseases problems. The conclusion is suggestive that within the selected area, irrespective of their literacy, Heart problems are spread. The prevention steps should be strengthened in the coming times.

Rates of Death Attributable to CVD Have Declined, yet the Burden of Disease Remains High

- The 2008 overall rate of death attributable to cardiovascular disease (CVD) (*International Classification of Diseases, 10th Revision*, codes I00–I99) was 244.8 per 100 000. The rates were 287.2 per 100 000 for white males, 390.4 per 100 000 for black males, 200.5 per 100 000 for white females, and 277.4 per 100 000 for black females.
- From 1998 to 2008, the rate of death attributable to CVD declined 30.6%. Mortality data for 2008 show that CVD (I00–I99; Q20–Q28) accounted for 32.8% (811 940) of all 2 471 984 deaths in 2008, or 1 of every 3 deaths in the India.
- On the basis of 2008 mortality rate data, more than 2200 Indians die of CVD each day, an average of 1 death every 39 seconds. About 150 000 Indians killed by CVD (I00–I99) in 2008 were <65 years of age. In 2008, 33% of deaths due to CVD occurred before the age of 75 years, which is well before the average life expectancy of 77.9 years.

Prevalence and Control of Traditional Risk Factors Remains an Issue for Many Indians

- Data from the National Health and Nutrition Examination Survey (NHANES) 2005–2008 indicate that 33.5% of adults ≥20 years of age have hypertension. This amounts to an estimated 76 400 000 adults with hypertension. The prevalence of hypertension is nearly equal between men and women. The adults have among the highest rates of hypertension in the world, at 44%.
- Among hypertensive adults, ≈80% are aware of their condition, 71% are using antihypertensive medication, and only 48% of those aware that they have hypertension have their condition controlled.
- Despite 4 decades of progress, in 2010, among Indians ≥18 years of age, 21.2% of men and 17.5% of women continued to be cigarette smokers. In 2009, 19.5% of students in grades 9 through 12 reported current cigarette use.
- The percentage of the nonsmoking population with detectable serum cotinine (indicating exposure to secondhand smoke) declined from 52.5% in 1999 to 2000 to 40.1% in 2007 to 2008, with declines occurring, and was higher for those 3 to 11 years of age (53.6%) and those 12 to 19 years of age (46.5%) than for those 20 years of age and older (36.7%).

The 2012 Update Expands Data Coverage of the Obesity Epidemic and Its Antecedents and Consequences

- The estimated prevalence of overweight and obesity in Indian adults (≥20 years of age) is 149 300 000, which represents 67.3% of this group in 2008. Fully 33.7% of US adults are obese (body mass index ≥30 kg/m2). Men and women of all race/ethnic groups in the population are affected by the epidemic of overweight and obesity.
- Among children 2 to 19 years of age, 31.7% are overweight and obese (which represents 23.6 million children), and 16.9% are obese (12.6 million children). Indian boys and girls and the girls are disproportionately affected. Over the past 3 decades, the prevalence of obesity in children 6 to 11 years of age has increased from ≈4% to >20%.
- Obesity (body mass index ≥30 kg/m^2) is associated with marked excess mortality in the Indina population. Even more notable is the excess morbidity associated with overweight and obesity in terms of risk factor development and incidence of diabetes mellitus, CVD end points (including coronary heart disease, stroke, and heart failure), and numerous other health conditions, including asthma, cancer, degenerative joint disease, and many others.

Government Policy Action

The Government needs to recognize CVD as a public concern and make prevention a thrust area in the 12th five year plan.

•According to an analysis, less than 3% of all global health assistance in 2007 in low and middle income countries was dedicated to NCDs.

Given the scale of the disease in India, an increase in resources allocated is needed, specifically for cardiovascular diseases and prevention of its risk factors.

•Given that a number of people are unable to afford adequate care, Government must ensure access through public health insurance and risk sharing, based on successful social health insurance experience.

•Centralized purchasing of medicine, medical supplies, and healthcare services can help reduce costs and set standard treatment guidelines.

•It has been established that prevention of CVDs is much cheaper than treatment. The Government should subsidize wellness by providing tax exemption for preventive health expenditure, such as fitness centre expenses and lifestyle improvement counselling

•Strengthen primary and secondary healthcare system by retraining medical staff to focus towards surveillance, prevention and counselling.

•Improve intermediate cardiac care by upgrading hospitals to handle acute cardiac incidents, by providing proper equipment like crash carts and defibrillators.

•Train community health workers, such as ASHAs, to raise awareness and to flag high risk people to the local health centre for timely intervention.

•Use ICT for improved health information systems for surveillance and monitoring of individuals. It will prevent people from falling off treatment and will also provide much needed information for development of evidence based methodologies.

Challenges and way ahead Less than 3% of all global health assistance in 2007 in low and middle income countries was dedicated to NCDs despite the rising disease burden.

•Use urban planning tools for promoting healthy behaviour like providing for parks and community gymnasiums, priority for pedestrians, and separate lanes and parking for cycling. Better public transport facilities and reduction in noise levels near residential areas help in decreasing stress levels.

•Regulate salt, sugar, and fat content in processed food in collaboration with the food industry. For example, salt intake levels were brought down by 10% in UK in four years without having any impact on the sales of companies.

•Regulate advertising of unhealthy food, especially those targeted towards children.
•Mandate the proper labelling of food to show its nutritional content and warn about excess levels of salt, sugar or fats.

References

1. Enas EA, Yusuf S, Mehta J. (1996). Meeting of international working group on coronary artery disease in South Asians. IHJ. 48: 727-32
2. Fowkes, FGR, Fulton PM. (1991). Critical appraisal of published research: introductory guidelines. BMJ.302:1136-40
3. Gupta, R.(2008). Recent trends in coronary heart disease epidemiology in India. IHJ supplement. 60:4-18
4. _____. (2005). Burden of coronary heart disease in India. Indian Heart J.57: 632-638
5. Gupta, R., Mishra A., Pais P., Rastogi P.(2006). Correlation of regional cardiovascular disease mortality in India with lifestyle and nutritional factors. IHJ. 108;291-300
6. Joshi, SR. (2005). Indian diabetes risk score. *J Assoc Physicians India* 2005; 53 : 755-7
7. Ott, MG. (1991). Importance of the study protocol in epidemiologic research. J Occ Med 1991; 33(12): 136-39
8. The Chemical Manufacturers Association's Epidemiology Task Group. Guidelines for good epidemiology practices for occupational and environmental epidemiologic research J Occ Med 1991; 33(12): 1221-29
9. Tomenson, JA and Paddle GM. (1991). Better quality studies through review of protocols J Occ Med 1991; 33(12): 1241-43
10. WHO. Preventing chronic diseases: a vital investment. Geneva. WHO 2005