EVIDENCE BASED PSYCHOSOCIAL AND BEHAVIORAL MODEL FOR PRIMARY AND SECONDARY PREVENTION OF ISCHEMIC HEART DISEASE FOR PAKISTANI POPULATION

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ABSTRACT:

BACKGROUND: The present study intended to suggest a model for primary and secondary prevention of IHD by exploring behavioral, psychological, social and self-reported family history of IHD, disease history and anthropometric factors for the possible early onset of IHD in Pakistan. The behavioral factors of the participants were evaluated by inquiring about smoking, number of cigarettes smoked daily and ex-smoking status and physical activity. Monthly family income, education, perceived social support and social dominance; psychological features investigated in this regard were the following: anxiety, stressful life events, perceived stress, depression, hostility, anger, locus of control and optimism. Regarding self-reported disease history, family history of IHD, diabetes and hypertension were incorporated; and anthropometric variables encompassed waist circumference, Body Mass Index (BMI) and Waist-Hip Ratio (WHR).

METHODS: Case-control research design was utilized, comprising 190 cases and 380 gender and age matched controls, aged from 35 to 55 years. Measures were translated in Urdu language following the forward –backward translation procedure, the translated Urdu version of all the measures was validated.

RESULTS: Binary logistic regression analyses showed that two or more traumatic life events, internal locus of control, family history of IHD, diabetes and BMI $\geq$ 25 kg/m2 are linked with risk of IHD; and optimism, 12 to 14 years of education and 4 or more hours of physical activity per week are protective factors of IHD. In men, occurrence of diabetes, physical activity of less than 4 hours a day, two or more stressful life events, being a smoker or an ex-smoker and smoking one pack or more cigarettes were risk factors for IHD. For men, optimism and external locus of control turned out to be significant protective factors of IHD. In women, trait anger was found to be concomitant with IHD. Social support played a protective role.

CONCLUSION: A model for primary and secondary prevention of IHD is hereby recommended in the light of present research findings.

KEY WORDS: Multivariate Odds Ratios, Primary prevention, Secondary prevention, Ischemic Heart Disease.

Author's Contribution

RR: Major contribution to the conception, design of the research and the acquisition, analysis and interpretation of data. NA: Interpretation of the results with the main author. Approval of the final version to be published.LA: Writing the discussion and editing the final version of the article.SA: Literature review and Data collection.

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INTRODUCTION:

Worldwide more than 30% of deaths are attributable to heart disease and stroke. One third of deaths result from CVD, among these 85% of CVD death burden has been reported from low down and central earnings countries like Pakistan.[1]

Research had demonstrated that 50% of decline in IHD can be attributed to changes in modifiable risk factors[2] and if psychosocial and behavioural risk factors can be modified a considerably high percentage of decline in mortality rates due to cardiovascular diseases is possible.[3] People who report greater number of stressful life events have an increased risk of IHD. Perceived stress is significantly associated with risk of IHD[4] Anxiety, depression, hostility and anger are generally termed together as negative emotions, and all of these factors are well recognized and independently associated coronary risk factors. Elevated anger[5] increased hostility have

been researched extensively and are considered to play an integral role in onset of IHD.[6]

Depression has been found to incur similar risk magnitude as conventional risk factors like smoking and hypercholesterolemia, in explaining CHD onset.[6] Unhealthy diet (diet rich in animal products: eggs and meat, salt, salty snacks, fried food, ghee, butter and low in fruits, vegetables and fish[5] contributes as risk factors in IHD. Chronological age, gender and family history of CHD are on the other hand considered non-modifiable risk factors of IHD. Major and massive shift of CHD morbidity and mortality from developed to developing countries over the next decades is an alarming situation[7] pointing towards a dire need for prompt action and planning and implementation of preventive measures. Current research has a methodology designed to examine multiple risk and protective factors simultaneously and in both men and women with a primary objective to propose a preventive model of IHD.

HYPOTHESES:

Hypothesis 1: Greater number of stressful life events, high stress, elevated anxiety, high depression, elevated anger increased hostility, lack of (internal) locus of control and diminished optimism are risk factors of IHD.

Hypothesis 2: Lower income, lower educational levels, lower social support, but high social dominance are risk factors of IHD.

Hypothesis 3: Elevated smoking, lack of useful level of physical activity, smoking more number of cigarettes are risk factors of IHD.

Hypothesis 4: Family history of IHD (diagnosed before the age of 55 years), presence of diabetes, and hypertension are risk factors of IHD.

Hypothesis 5: BMI ($\geq$ 25 kg/m2) and higher WHR and waist circumference are risk factors of IHD.

METHOD:

Research design: Case control design was utilized in this study.

Sampling strategy: The cases and controls were recruited with the help of purposive sampling technique.

INCLUSION CRITERIA:

We recruited cases that were acknowledged by the coronary care service unit or hospital, if they had suffered from a single episode of angina with pain in the chest as diagnosed by the cardiologists. For patients who have onset of acute myocardial infarction (AMI), the cardiologists confirmed the di-agnoses on the evidence generated from changes in electrocardiogram or clinical symptoms were included in the sample.

EXCLUSION CRITERIA:

Patients who had undergone chest pain due to non-cardiogenic reasons; patients suffering from a major persistent medical disorder including: hyperthyroidism or hypothyroidism, liver disease, malignancy, renal disease; pregnant women as well as patients with a preceding history of any psychiatric diagnosis and/or illness were excluded from the study.

MEASURES:

PSYCHOLOGICAL FACTORS:

Stressful Life Events. Study participants were asked whether they had experienced any stressful life event/events during the past year. To calculate the Odds Ratio (OR), a reference category was determined none vs. one and two or more stressful life events.

The Perceived Stress Scale. Urdu version of the Perceived Stress Scale (PSS) was administered. [6] It computes enormity of traumatic circumstances in one's life and current degree of knowledgeable stress.

Center for Epidemiological Studies Short Depression Scale. (CES-D 10).[8, 9] This 10-item scale was developed to determine self-reported symptoms or features of depression.

State-Trait Anxiety Inventory (STAI).[10] This scale evaluates the predisposition to respond in an anxious manner to supposed threats in a stressful circumstances.

State-Trait Anger Expression Inventory (STAXI).

This inventory, developed by Spielberger, comprises of 10 scale items that determine condition and trait anger on a 4-point Likert scale.

Personality Deviance Scale-Revised (PDS-R). For the current research, hostility subscale was analyzed and eight of its most pertinent items were integrated in the assessment measures.[3]

Revised Life Orientation Test (LOT-R). This 10-item scale, developed by Scheier et al.,[11] to assess generalized optimism (versus pessimism). Greater scores signifying higher levels of optimism.

Perceived Locus of Control Scale. To assess apparent capability in managing life conditions and optimistic prospect for the future, the assessment measure comprising six items was used. It has been applied extensively in Eastern European researches of a similar nature.[12]

SOCIAL FACTORS:

Monthly Income. This was evaluated by inquiring the household monthly income per person (in Pakistani rupees).

Education. Education was characterized as 10 or less duration of formal education. In addition, 14 years or less of formal schooling (an Intermediate certificate or a Bachelor's degree) was also included as a category. 16 or more years of university level formal instruction consisted of a Master's degree or an equivalent degree.

Multidimensional Scale of Perceived Social Support (MSPSS). This assessment measure was developed by Zimet et al.[13] It consists of 12 items which are composed in a 7 point Likert-type scale.

Personality Deviance Scale-Revised (PDS-R)[3] To measure dominance a subscale of PDS encompassing of 6 items with four feasible responses on each item in a 4 point Likert scale

BEHAVIORAL FACTORS:

The information regarding behavioral risk factors smoking status (current, ex-smoker and never smokers), number of cigarettes smoked and physical activity was gathered, detailed description of these measures is as follows.

Smoking. Smoking status included (current, ex-smoker and non-smoker), for smokers who reported smoking cigarettes, further information regarding age at which smoking was started and number of cigarettes smoked per day was obtained.

Physical Activity. Physical activity was defined as regular involvement in moderate to strenuous activities (walking, cycling, jogging, gymnasium exercise, gardening and sports.[14]
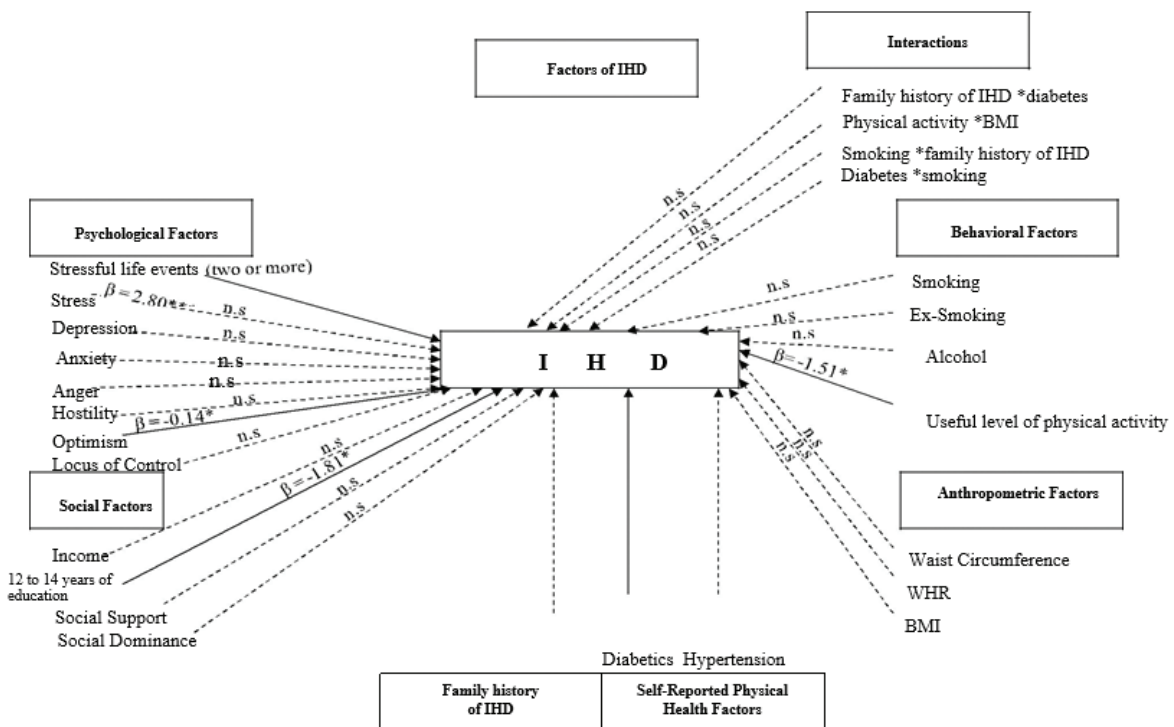
PROCEDURE:

Authorization by directorial and ethics committees from hospitals (Jinnah Hospital, Gulab Devi Hospital, Mayo Hospital, Punjab Institute of Cardiology and Combined Military Hospital) was sought by the researcher prior to initiating the study. Permission form was composed in Urdu and was distributed amongst the participants to give their assent for participation. Participants were informed that discretion and privacy of their data will be guaranteed and that they could withdraw their assent at any stage and that they would not be liable to any penalty. On completion the researchers debriefed them about the background of this research.
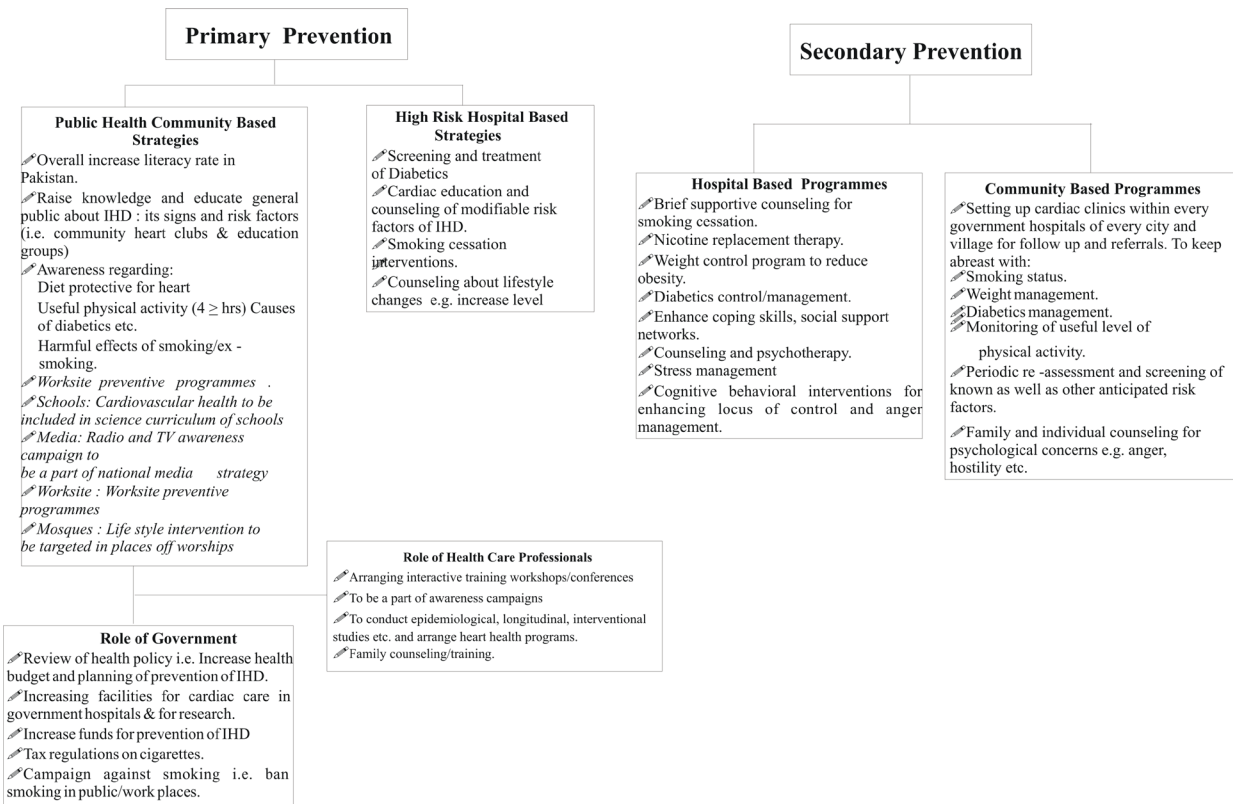
DATA ANALYSES:

Binary logistic regression analyses were ad-

Figure 1. Psychosocial and behavioural model of IHD based on binary logistic regression, conducted on cases and controls (overall data) adjusted for age, gender and smoking. Note. R^2 = .42 (Cox & Snell), .62 (Nagelkerke), Model χ^2 (8) = 101.44, p < .001.

Figure 2. A proposed model of primary and secondary prevention of Ischemic Heart Disease.

Primary Prevention

Secondary Prevention

Public Health Community Based Strategies
- Overall increase literacy rate in Pakistan.
- Raise knowledge and educate general public about IHD : its signs and risk factors (i.e. community heart clubs & education groups)
- Awareness regarding:
  Diet protective for heart
  Useful physical activity (4 ≥ hrs) Causes of diabetics etc.
  Harmful effects of smoking/ex - smoking.
- Worksite preventive programmes .
- Schools: Cardiovascular health to be included in science curriculum of schools
- Media: Radio and TV awareness campaign to be a part of national media strategy
- Worksite : Worksite preventive programmes
- Mosques : Life style intervention to be targeted in places off worships

High Risk Hospital Based Strategies
- Screening and treatment of Diabetics
- Cardiac education and counseling of modifiable risk factors of IHD.
- Smoking cessation interventions.
- Counseling about lifestyle changes e.g. increase level

Hospital Based Programmes
- Brief supportive counseling for smoking cessation.
- Nicotine replacement therapy.
- Weight control program to reduce obesity.
- Diabetics control/management.
- Enhance coping skills, social support networks.
- Counseling and psychotherapy.
- Stress management
- Cognitive behavioral interventions for enhancing locus of control and anger management.

Community Based Programmes
- Setting up cardiac clinics within every government hospitals of every city and village for follow up and referrals. To keep abreast with:
- Smoking status.
- Weight management.
- Diabetics management.
- Monitoring of useful level of physical activity.
- Periodic re -assessment and screening of known as well as other anticipated risk factors.
- Family and individual counseling for psychological concerns e.g. anger, hostility etc.

Role of Health Care Professionals
- Arranging interactive training workshops/conferences
- To be a part of awareness campaigns
- To conduct epidemiological, longitudinal, interventional studies etc. and arrange heart health programs.
- Family counseling/training.

Role of Government
- Review of health policy i.e. Increase health budget and planning of prevention of IHD.
- Increasing facilities for cardiac care in government hospitals & for research.
- Increase funds for prevention of IHD
- Tax regulations on cigarettes.
- Campaign against smoking i.e. ban smoking in public/work places.

ministered though utilizing the forward method to confirm the hypotheses. Apropos binary or ordinal variables, a reference group with minimal risk was used.(see figure 1)

A Binary logistic regression analysis was executed via forward conditional method, with IHD as the outcome variable and psychological, social, behavioral, familial history of IHD, physical health factors and anthropometric factors. Moreover four pairs of risk factors were checked whether they interact synergistically in the prediction of IHD: (a) Physical activity and BMI (b) Smoking and diabetes (c) family history and diabetes and (d) Smoking and family history of IHD as predictor variables.

RESULTS:

Presence of IHD (Omnibus Chi-squre = 101.44, df = 8, p< .001) was significantly predicted by the complete model. The model considered approximately between 42% and 62% of variance in IHD and generally 87% of the predictions were precise. After adjustment for all baseline covariates, no significant interaction between BMI and physical activity, smoking and diabetes was found. Likewise, negligible interactions between family history and diabetes with smoking and family history of IHD

and the risk of IHD were found. In fact, the model did not improve considerably after including all the significant interactions.

There were no significant overall effect modifications of physical activity by BMI, both remained independent predictors. Likewise, the interaction terms between smoking and diabetes, family history and diabetes along with smoking and family history of IHD were not significant as accrued from the statistical analysis.

Another Binary logistic regression analysis was conducted to find out behavioral, psychological, social, family history of IHD, physical health factors and anthropometric factors associated with IHD in Men by utilizing forward conditional procedure, with IHD as the outcome variable and psychological, social, behavioral, family history of IHD, physical health factors and anthropometric factors as predictor variables. Approximately 214 men's cases and controls were scrutinized and subsequent analysis confirmed that the full model significantly predicted presence of IHD (Omnibus Chi-square =117.69, df = 9, p <.001).The model accounted for between 42 % and 62 % of variance in IHD. After a comprehensive analysis, 89.7% of the pre-

dictions were found to be accurate.

A third Binary logistic regression analysis was administered to find out behavioral, psychological, social, family history of IHD, physical health factors and anthropometric factors associated with IHD in women by employing forward conditional method. IHD was categorized as the outcome variable and behavioral, family history of IHD, physical health, psychological, social factors and anthropometric factors as predictor variables. A sample comprising 81 women's cases and corresponding controls were evaluated. As a result, the complete model significantly predicted presence of IHD (Omnibus Chi-square =57.22, df = 2, p < .001).The model accounted for variance in IHD which turned out to be between 50 % and 77 %. Overall 93.8 % of the predictions were accurate

DISCUSSION:

In Pakistan, the population ranging between ages 35 to 55 years, diabetes, BMI $\geq$ 25 kg/m^2, experience of a couple or more traumatic life proceedings, bodily activity less than four hours per week, education less than 12 years, low level of evident locus of control, and lower degree of optimism were evaluated for substantial risk factors of early onset IHD. Four pairs of risk factors namely physical activity and BMI, smoking and diabetes, family history and diabetes and smoking and family history of IHD were tested to interact synergistically in the prediction of IHD. However, these interactions after relevant analysis were not statistically significant. The findings confirmed the results of previous studies that found that diabetes[15] BMI $\geq$ 25 kg/m^{2,20} experiencing a couple or more stressful life events, bodily exercise less than four hours per week,[12] education less than 12 years, low level of perceived locus of control and lesser level of optimis[16] as risk factors of IHD.

More specifically when the analysis was demarcated for gender (men), results indicated that presence of diabetes, presence of two or more taxing life occasions, being an ex-smoker or a habitual current smoker (smoking 20 or more cigarettes per day), physical activity of less than four hours weekly, lower level of optimism and decreased perceived locus of control were associated with risk of IHD. An extensive body of research already exists that confirms the results of the present study.[6] Multiple regression interactive analysis performed to investigate independent as well as interactive effect of factors of IHD, did not improve considerably after including four pairs of interactions.

There was no significant overall effect modi-

fication of physical activity by BMI. This outcome is replicated by the findings from other global empirical researches. Studies in this area showed that physical activity and BMI are independent predictors of IHD,[17] In our study we tested the interactive effect of physical activity and BMI by taking over all data; further analyses separately on male and female data might be helpful in exploring the interactive effect between these two factors.

The present study adds that the odd of IHD is higher in ex-smokers as compared to smokers, and this evidence is contradictory to earlier findings.[15] The difference in results compared to that of our study can be attributed to the fact that termination of smoking is related to corresponding weight gain,[14] and elevated BP[18] both of these are independent risk factors of IHD. The current study provides a potential target for implementation of weight control strategies in smokers who plan quitting smoking.

IMPLEMENTATIONS FOR INTERVENTION:

Authors developed a model of primary and secondary prevention of IHD. The former i.e., primary prevention denotes two highly correlated and significant features: public fitness community-based tactic and high risk hospital based plans. In contrast, an overview of community based in addition to hospital precautionary courses is evident in secondary prevention approach. A model for primary and secondary prevention based on recognized predictors of IHD ubiquitous within the native population is, therefore, proposed (see Figure 2).

Primary prevention. It can comprise of the aforementioned features i.e., public health community based and high risk hospital based approaches. It is extremely vital to increase the level of literacy within the country by providing easy and affordable access of the common man to education. Another focal point of prevention is the provision of heart health education to the general public.

High risk hospital-based strategies. Major focus of hospital-based primary intervention can be to timely screen for diabetes, to help diabetic patients from further complications. Counseling and psychotherapy for psychological concerns as well as for physical activity and diet regime can be useful. Life style interventions like dietary modification can be planned for high risk candidates. Smoking cessation interventions involving weight control can be facilitated for candidates at risk.

Secondary prevention. Hospital based pro-

grams: Secondary interventions that can be carried out in the hospitals require an emphasis on integrating psychosocial and behavioral risk factors of IHD along with traditional risk factors of IHD in there palliative approach. Cognitive behavioral interventions and Rational Emotive Therapy for the management of perceived control and to increase level of optimism as well as techniques to enhance coping skills to deal with stressful life events can be helpful.

Community based programs. Secondary prevention through community-based programs can be facilitated by convenient and affordable access to local cardiac care facilities. Affordable screening of known and suspected risk factors of IHD can be made available through these centers. Follow up regarding smoking, weight management, diabetes control, maintenance of physical activity up to a useful level can be facilitated. Special facilities for family and individual counseling, as well as nutritional counseling, can be provided through these centers.

STRENGTH OF THE STUDY:

The current study included a considerably large sample size (n = 570), much larger than that utilized by previous studies conducted in Pakistan.[19] In this study two controls per case were enrolled that added power to the study.

Like any other research, this present study has certain limitations. The research was conducted and evidence concerning risk factors were gathered post – ailment, as patients' medical histories which compose the data were in hospital after the onset of a first episode of MI or angina.

CONCLUSION:

Ischemic Heart Disease is increasing in Pakistani population and the medical cost to counter the disease is extremely high. Our study provides guidelines for primary and secondary prevention of IHD. In future large scale prospective studies can be designed to provide a preventive model of IHD for different geographic sectors of the nation, e.g., urban vs rural, as well as for population sectors that differ in income and occupation levels.

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