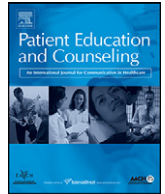




Contents lists available at ScienceDirect

Patient Education and Counseling

journal homepage: www.elsevier.com/locate/pateducou



Patient Perception, Preference and Participation

Explanatory models of coronary heart disease among South Asian immigrants

Manasi Ashok Tirodkar^{a,*}, David William Baker^b, Neerja Khurana^b, Gregory Makoul^c,
Muhammad Wasim Paracha^d, Namratha Reddy Kandula^b

^a National Committee for Quality Assurance, Washington, DC, USA

^b Division of General Internal Medicine, Northwestern University Feinberg School of Medicine, Chicago, IL, USA

^c Saint Francis Hospital and Medical Center, Hartford, CT, USA

^d Asian Human Services Family Health Center, Inc., Chicago, IL, USA

ARTICLE INFO

Article history:

Received 5 February 2010

Received in revised form 30 September 2010

Accepted 4 October 2010

Keywords:

South Asian

Coronary heart disease

Health beliefs

ABSTRACT

Objective: This study investigated South Asians' explanatory models (EM) of CHD and compared them to the biomedical model as part of an effort to inform the development of culturally targeted CHD prevention messages.

Methods: We conducted in-depth, semi-structured interviews in English, Hindi and Urdu with 75 respondents from a federally qualified health center and at a community center for South Asian immigrants in Chicago, Illinois.

Results: While EMs of CHD included risk factors from the biomedical model, they also included psychosocial and spiritual risk factors. Respondents emphasized that stress causes CHD and suggested that CHD was caused by sudden or inexplicable factors. Few respondents discussed cholesterol, blood pressure, or diabetes as part of CHD prevention. Women and those with lower education had low perceptions of being at-risk for CHD.

Conclusion: South Asians' EMs of CHD encompassed the biomedical model; however, EMs also included psychosocial and spiritual factors.

Practice implications: Clinicians and health educators should be aware that South Asian individual's EM of CHD may include psychosocial and spiritual factors which can affect CHD prevention behaviors.

© 2010 Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Coronary heart disease (CHD) is the leading cause of death among Asian Indians and Pakistanis (South Asians) in the United States [1,2]. Growing evidence suggests that South Asians may be more susceptible to CHD than other US racial/ethnic groups because of a combination of traditional, novel, and genetic risk factors [3–6]. Among U.S. Asian groups, South Asians have higher rates of overweight/obesity [7] and report the least physical activity [8]. Other factors may also be involved, such as higher lipoprotein(a) levels [1,9], tissue-type plasminogen activator [10], and a high prevalence of the metabolic syndrome and type-2 diabetes mellitus [6,11,12]. Despite increasing calls for CHD prevention efforts to be targeted to minorities [13], few CHD prevention efforts in the US are directly targeting the high risk South Asian group.

A recent statement on CHD disparities highlighted the importance of addressing cultural beliefs and practices when designing CHD prevention interventions because of their effect on patients' preferences, behaviors, and health care utilization [13]. One way to address cultural beliefs and practices for health interventions is to develop targeted messages, which are designed to reach a defined population sub-group, generally based on demographic characteristics. Targeted messages differ from tailored messages, which are created for individuals [14]. Successful development of targeted messages requires understanding the health beliefs or explanatory models (EM) of the community of interest [15]. The EM is used to understand for eliciting individual or family views about the illness experience including etiology, time and mode of onset, pathophysiology, prognosis and treatment [16]. The type of EM held by patients influences receptivity to health promotion messages [17,18], health behaviors [19], and what course of treatment an individual follows [20]. Studies that have explored variations in EMs have found that EMs of illness and disease are influenced by people's social and cultural contexts and prior experiences [21–23]. While the literature can provide some guidance, it is critical to identify current EMs of the target population before developing and

* Corresponding author at: National Committee for Quality Assurance, Research and Performance Measurement, 1100 13th St. NW, Suite 1000, Washington, DC 20005, USA. Tel.: +1 202 955 3580; fax: +1 202 955 3599.

E-mail addresses: tirodkar@ncqa.org, mtirodkar@gmail.com (M.A. Tirodkar).

disseminating a message. Studies in other immigrant populations have shown that there is a lack of knowledge about CHD, especially about risk factors and prevention [24], and that culturally targeted interventions for specific ethnic populations might be the best way to communicate health information [25–27].

Even though South Asians in the US are at very high risk for CHD [1,2], little is known about how they conceptualize CHD etiology and prevention and if these concepts differ from a biomedical model. CHD prevention guidelines and messages in the U.S. are based on a biomedical model and focus on several major modifiable risk factors: smoking, high cholesterol, high blood pressure, diabetes, high fat diet, physical inactivity, and obesity [28]. It is unclear to what extent South Asians, the majority of whom are immigrants, have incorporated current biomedical thinking into their beliefs about the causes of CHD, and if they are aware of the major modifiable risk factors. Studies from the United Kingdom have shown low levels of knowledge in South Asians about what causes heart disease, especially among individuals from Pakistan and Bangladesh [29,30]. In this study, semi-structured qualitative interviews were used to elicit South Asians' EMs of CHD, determine their perceptions about being at-risk for CHD, and identify common themes that can inform CHD prevention efforts targeted at South Asians. This study provides a foundation and framework for the design of culturally targeted CHD education messages and a community-based CHD prevention intervention for South Asians in the US.

2. Methods

2.1. Research setting & Recruitment Strategy

Seventy-five participants were recruited from a federally qualified health center (FQHC; $n = 48$) and a community center ($n = 27$) that provides non-health care related services for immigrants. The FQHC and one of the community centers are located in the West Ridge and Rogers Park neighborhoods of Chicago, Illinois, a densely populated residential area which encompass Devon Avenue, one of the two largest South Asian business districts in North America. Compared to the general South Asian population in the U.S., the South Asians in West Ridge/Rogers Park are more recent immigrants, have lower socio-economic status (SES), and lower English proficiency [31]. Flyers informing patients about the study were distributed in the FQHC and community organizations; staff at both sites referred South Asian clients to the interviewer who was stationed at the sites. The interviewer also approached patients in the waiting areas about the study and distributed flyers to them. Respondents were encouraged to inform their friends and family members about the study and schedule an interview directly with the interviewer. Interviews were conducted on-site, in a private room.

2.2. Participants

According to local census data [31], Hindi and Urdu are the most common languages spoken by South Asian residents in this neighborhood of Chicago. Therefore, this study was limited to adults (20–75 years of age) who self-identified as Asian Indian or Pakistani and who spoke Hindi, Urdu or English.

2.3. The interview

In a semi-structured interview, respondents were first asked about concepts of health and disease in general (described in Ref. [32]) and then were asked more specifically about concepts of CHD etiology and prevention. The prompts use the term “heart disease” and “heart attack” to denote CHD. We chose “heart disease” and

“heart attack”, rather than “coronary heart disease” or “coronary artery disease” because pilot interviews suggested that the former were better understood and could be translated into Hindi and Urdu in an equivalent way. Interviews lasted between 30 and 45 min and were conducted by the interviewer who is fluent in Hindi, Urdu, and English. Hindi and Urdu interviews were later transcribed verbatim and translated into English by the interviewer who conducted the interviews.

Regardless of recruitment method, the interviewer first asked the participants their age, country of origin and preferred language for the interview to determine eligibility for participation in the study. All other demographic questions, included marital status, education, occupation, religion and insurance status were asked at the end of the interview. Weight and height were also measured.

2.4. Coding scheme and data analysis

Ten pilot interviews were used to create a comprehensive coding scheme using an open coding method common to grounded theory methodology [33,34]. This means that themes were coded whenever they occurred in the transcript and not only in response to the prompts. We developed an initial coding scheme which was modified by the research team as needed during the interview and coding process. The coding scheme for the EM of CHD included four main domains: physiologic (i.e., high blood pressure, cholesterol, diabetes), psychosocial (i.e., stress, depression) behavioral (i.e., high fat diet, not exercising, smoking), and spiritual (i.e. God, fate). Seventy-five (non-pilot) interviews were conducted to ensure that we would have adequate cell sizes across gender, age, and language. All 75 interviews were coded by the first author using NVivo 7 qualitative data analysis software [35]. Twenty percent of the interviews were randomly selected to code by NK to verify coding consensus and establish inter-coder reliability. Coding discrepancies were resolved by discussion and codes were modified to reflect the resolution. Reliability coefficient was found to be 99% agreement between coders after discussion of discrepancies.

In addition to qualitative data analysis, descriptive statistics were calculated for the socio-demographic characteristics of the participants and to determine if there were any differences in perceptions of being at risk for CHD by socio-demographic characteristics. First, we describe how respondents defined heart disease and what they perceived to be the major health issues in their community. Second, we describe the common themes that emerged about CHD etiology and prevention for the group as a whole. Lastly, we present respondents' perceptions of being at-risk for CHD and use χ^2 statistics to examine how perceptions of being at-risk differed by socio-demographic characteristics. Quantitative data analysis was performed using Stata 9.1 [36]. Two-tailed tests were used for all analyses, and a final p -value of 0.05 was used to determine statistical significance.

3. Results

3.1. Respondent characteristics

Our sample was similar in age, education, years in the US, gender, and country of origin to the South Asian community profile of the North side Chicago neighborhood drawn from the 2000 Census data [31]. There were equal numbers of men and women in the sample (Table 1). The sample included equal numbers of participants in the 20–39 and 40–59 age groups; despite attempts to recruit older adults (60+) there were fewer participants were in this age group. In general, education levels were high with 57% of respondents ($n = 43$) having completed college or more. Twenty percent ($n = 16$) of the sample had less than a high school

Table 1
Respondent characteristics.

Total N=75	n (%)
Gender	
Male	38 (50.6)
Female	37 (49.3)
Age	
20–39 years	29 (38.6)
40–59 years	29 (38.6)
60+ years	17 (22.6)
Education	
Less than high school	16 (21.3)
High school	10 (13.3)
Some college	6 (8)
Bachelor's degree	31 (41.3)
Master's degree	12 (16)
Health insurance	
None	41 (54.6)
Public aid	18 (24)
Private insurance	9 (12)
Do not Know ^a	7 (9.3)
Language of interview	
Urdu	28 (37.3)
Hindi	24 (32)
English	23 (30.6)
Years in US	
10 years or less	53 (71)
More than 10 years	22 (29)
Religion	
Muslim	51 (68)
Hindu	16 (21.3)
Other ^b	8 (11)

^a Includes those who did not know whether they had insurance at all and those who had a “card” but did not know what it was for.

^b “Other” religions include Sikh and Christian.

education, and most ($n = 12$) of these were women. Over half the respondents were uninsured and about a quarter had public insurance. Seventy percent immigrated to the US within the past 10 years (defined by the Census as a “recent immigrant”) [31].

3.2. Self-reported risk factors for CHD

Respondents were also asked about their medical history. Thirty-two percent reported having hypertension, 21% high cholesterol and 19% reported diabetes. Eighty-seven percent of respondents were clinically overweight based on the World Health Organization's Body Mass Index cutoff for South Asians

(BMI > 23 kg/m²) [37]. Eighty-five percent of respondents reported little or no regular physical activity. Additionally, eight respondents (11%) reported a history of heart disease. Over half of the respondents reported having a family member with heart disease.

3.3. Definitions of heart disease

To elicit general understanding and definitions of heart disease the interviewer asked, “Tell me in your own words, what is heart disease?” Eighty percent of respondents used terms that capture some aspect of CHD including “accumulation of fat”, “coronary artery disease”, and “heart attack”. Some examples of respondents' descriptions are, “I have heard that this grease gets stuck. It gets accumulated in the heart pipes so because of that it closes” (Female, 64 years). Several respondents said that they did not know much about heart disease, but did use terminology associated with CHD, “I heard about the coronary heart disease, but I don't understand what it is that much. I heard about the blocking, like you get a blocking in a heart and it contributes to the heart attack. You know-like heart failure” (Male, 46 years). Others defined heart disease in terms of the symptoms of a heart attack, “I have heard about heart disease, like people say there is chest pain” (Male, 72 years). One respondent also described a medical procedure for diagnosing CHD, “One is heart attack and one people get angiography done” (Female, 52 years).

3.4. Explanatory models of CHD etiology

To determine EMs of CHD we asked, “What are some of the causes for a heart attack,” and “have you ever known anyone who had a heart attack, and if yes, why do you think they had a heart attack?” Respondents' EMs commonly included psychosocial, behavioral, and physiologic domains. Eighty-eight percent of respondents mentioned stress and it emerged as the most frequently mentioned psychosocial theme. Some people talked about stress as the direct cause of heart attack (Table 2). Several people described stress as contributing to other risk factors of a heart attack such as diabetes and cholesterol.

Respondents also identified behavioral factors, especially diet, as an important cause of heart attacks (Table 2). Most respondents talked about diet in general, while one-third of respondents specifically mentioned fatty foods. Several respondents discussed their belief that certain South Asian foods and cooking methods

Table 2
South Asian immigrants' explanatory models of what causes a heart attack.

Domain ^a	Quotes from interviews that are illustrative of each domain
Psychosocial	“They say that when people worry a lot or have too many tensions on them the heart aches or anything can happen.” (Female, 36 years) “When you are under stress then your blood pressure starts varying and your sugar also. People say that you can get diabetic if you stay stressful continuously, and if there is a disorder in your food. Then because of that your cholesterol could go high. And those can be the causes of your heart attack. (Male, 57 years)
Behavioral	“The only right way to prevent a heart attack is to eat less, eat clean food, eat home cooked food, eat less of <i>ghee</i> (clarified butter) and oil, eat green vegetables eat fruits and all and if you are taking milk then do not take it more than one glass once in a day (Female, 43 years) “Heart attack. ... anybody can have it especially here in America, aah, if for 3 years you don't exercise and you also eat all kinds of food.” (Male, 57 years)
Physiologic	“I have heard from people that those who have <i>sugar</i> and <i>blood pressure</i> they have heart attack.” (Female, 52 years) “the only thing is the very first thing it comes to my mind is the increase of cholesterol level in the blood that may cause that maybe one of the cause for this heart attack?” (Female 24 years)
Adverse event	“...Watching cricket game and getting the favorite player out and the person gets heart attack right there and he dies. Just sudden shock you know.” (Male, 26 years) “if at that time you experience some other shock so then I think that heart will not be able to tolerate that.” (Female, 34 years)
Spiritual	“Put all your mind and attention towards God, you won't get a heart attack. Remember this: that you cannot do anything, he (God) does whatever happens. ...” (Male, 70 years) “God only knows, its in his hands he can only make things better. ... <i>medicines</i> also don't work, if God has written he won't live long then nobody can increase it.” (Female, 47 years). “I can definitely say this, that it all depends on your deeds.” (Male, 60 years)

^a Domains are listed in order of the frequency at which they were mentioned by respondents.

such as using *ghee* (clarified butter) contributed to heart attacks (Table 2).

Forty-six percent of respondents discussed physical inactivity as a behavioral factor causing heart attack (Table 2). Very few people identified smoking (17%) when discussing their EMs of CHD. One-third of respondents talked about the major physiologic risk factors for heart attack, such as cholesterol and high blood pressure. Slightly fewer (27%) mentioned diabetes (commonly called “sugar” in this community) as a cause. Two other themes that emerged during the discussion of EMs of CHD were the belief that heart attacks are caused by a sudden adverse event (19%) and that heart attacks are determined by one’s fate or are in the hands of God (15%) (Table 2).

3.5. Subgroup differences in EMs of CHD etiology

EMs of CHD differed by demographic characteristics. Individuals with lower education (high school or below) mentioned blood pressure (23% vs. 39%), diabetes (19% vs. 39%), cholesterol (12% vs. 49%), lack of exercise (8% vs. 37%) and smoking (4% vs. 24%) much less frequently when discussing what causes heart attacks compared to respondents with higher education (more than high school). Individuals with low education also more frequently talked about fate (31% vs. 6%) as causing heart attack. Individuals that interviewed in Hindi or Urdu less frequently mentioned lack of exercise (24% vs. 33%) and smoking (14% vs. 25%) and more frequently mentioned fate (20% vs. 4%) as compared to those who interviewed in English.

3.6. Explanatory models of coronary heart disease prevention

To determine EMs of CHD prevention, respondents were asked “what are some of the ways heart attacks can be prevented?” In contrast to the domains for heart attack etiology, the behavioral domain was most frequently mentioned for heart attack prevention (see Table 3). Eating a better diet and exercising were most common, and over half the respondents mentioned each of these. The discussions on diet focused on general concepts like eating in moderation or eating home-cooked food. Some respondents were more specific and talked about eating less fat in the diet. Although 85% of respondents said they did little or no regular physical activity, 51% talked about exercise as a way to prevent heart disease. Interestingly, 8% ($n = 6$) of Muslim respondents mentioned their prayers (*namaaz*), which involves a series of kneeling and standing positions, as a form of exercise, “This is not a treatment. It is a must for a Muslim. Praying is also a kind of an exercise, yoga. We bend down actually; think of it as an exercise or yoga type. Five times bending in front of god is a kind of an exercise” (Female, 39 years).

The psychosocial domain emerged as the second most frequent when discussing EMs of CHD prevention (Table 3). Avoiding stress and having a positive mindset were described as ways to prevent heart attacks by one-third of respondents. Very few individuals (16%) specifically discussed controlling high blood pressure, cholesterol, and diabetes as part of heart attack prevention (Table 3). In contrast to the discussion about what causes CHD, very few respondents invoked spiritual factors as part of CHD prevention.

3.7. Subgroup differences in EMs of CHD prevention

When asked about what prevents heart attacks, very few people with lower education (8%) talked about controlling high blood pressure, cholesterol, and diabetes compared to people with higher education (26%). Individuals interviewed in English mentioned exercise (67% vs. 43%) and not smoking (13% vs. 2%) as beneficial to preventing a heart attack more frequently than those who interviewed in Hindi or Urdu. Interestingly, while women more frequently mentioned prayer (11% vs. 0%) and having positive thoughts (14% vs. 5%) than men, women also discussed having a check-up with a doctor for heart attack prevention (35% vs. 21%) more frequently than men.

3.8. Perceptions of being at-risk for heart attack

Respondents’ perceptions of being at-risk for heart attack were elicited by asking, “Do you think that you can get a heart attack?” Almost half (48%; $n = 36$) of the respondents answered yes to this question. Although the small sample sizes limited the ability to achieve statistical significance, the trends show that fewer individuals with low education thought they were at-risk for heart attack compared to those with higher education. Women also said they were not at-risk for heart attack more frequently than men. Respondents who were interviewed in Hindi/Urdu also seemed less likely to think they were at-risk compared to those who were interviewed in English.

Many of the respondents, who said they did not think they could get a heart attack or they did not know, talked about the future being in the hands of God or being unpredictable. For example, one respondent said they were not at-risk because, “just that I have feelings that it cannot happen. But I can’t say anything about the future because God knows” (Female, 39 years). Respondents also frequently said they were not at-risk for a heart attack because they were not under any stress, “I mean I don’t have any tension. My husband keeps me happy. My kids also study well and everyone is fine in India” (Female, 36 years). Among those who said they could have a heart attack in the future, many focused on their known risk factors and because of a family history of CHD. One respondent said, “Because I am a diabetic patient. So when you

Table 3
South Asian immigrants’ explanatory models of what prevents a heart attack.

Domain ^a	Quotes from interviews that are illustrative of each domain
Behavioral	“The only right way to prevent a heart attack is to eat less, eat clean food, eat home cooked food, eat less of ghee and oil, eat green vegetables...” (Female, Age 43 years) “Yeah, I’m drinking skim milk, no eating butter, no smoking, no drinking.” (Male, 69). “To prevent a heart attack, I would say... I mean, my first and foremost point is that keep your self active go for walk daily. I would say this is the remedy for every disease” (Female, 25 years).
Psychosocial	“Don’t take any kind of affect on your mind it can affect your heart as well” (Male, 58 years) “A person should stay fresh should step out for strolling to keep his mind fresh remain tension free.” (Female, 25 years).
Physiologic	“Heart attack can be prevented, such that your heart arteries and your cholesterol level, all these things remain under control and diabetes also stays under control.” (Male, Age 57 years) “Prevention is achieved when a person without any disease goes to a doctor and gets his check-up done. Doctor tells him whether his blood pressure is high, or you have sugar, or your cholesterol has gone high.” (Male, 57 years)
Spiritual	“If God is kind to you, then by grace of god it can become easy and fine” (Female, Age 52 years)

^a Domains are listed in order of the frequency at which they were mentioned by respondents.

have sugar, it is said that blood starts to get thicker and like sugar is the mother of diseases, it gives birth to other diseases wherein first and foremost comes heart diseases. Also it's there in the family; therefore I have it in my mind that I can get heart disease even though my blood pressure stays controlled" (Female, 39 years). People also talked a lot about how their lifestyle put them at increased risk, "I don't exercise. I eat all these foods. . . don't eat on time so it can happen" (Male, 48 years).

4. Discussion and conclusion

4.1. Discussion

This study presents the most detailed data to date on concepts of CHD among a South Asian population in the U.S. It identifies important differences between South Asians' explanatory models of CHD and the biomedical explanatory model which underlies most CHD prevention messages. We found that in general, respondents had an understanding of CHD and knew about the behavioral factors that contribute to CHD, such as unhealthy diet and physical inactivity. However, participants' strong focus on stress as contributing to CHD, suggests that South Asians' explanatory models may differ from the biomedical model. Evidence for this difference may be found in the discussions about CHD prevention, where very few respondents talked about controlling cholesterol, blood pressure, diabetes, or smoking, but one-third talked about reducing stress. South Asians in this study had a better understanding about CHD compared to prior studies of South Asians in the United Kingdom [30] and Canada [38]. Rankin & Bhopal [30] found that South Asians in the UK generally could not provide the description, meaning, cause or preventive measures for CHD. In a similar study, there was no difference in heart disease knowledge between those with and without CHD [39]. The difference in knowledge levels between South Asians in our study and the UK study is likely due to the fact that the UK sample had lower education levels.

Although stress is also part of the biomedical model for CHD, South Asians in this study discussed stress more frequently than any other risk factors. A qualitative study of South Asians in the United Kingdom [40], also noted that stress was one of the main themes when participants were asked about the causes of CHD. While studies have shown that minorities often cite stress as a key factor in developing heart disease [30,41–43], it is unknown if the belief that stress causes CHD is as prevalent in the general U.S. population [43]. Forty-four percent of respondents in the Minnesota Heart survey named stress as a risk factor for CHD [44], albeit the Minnesota survey was two decades ago. A more recent survey of women in the U.S., found that stress was cited as a CHD risk factor by 18% of women [45] and that 74% of women said stress management was a CHD prevention measure [46]. CHD prevention messages for U.S. South Asians may want to address the health effects of stress and stress management as one way to engage this community in CHD prevention.

We also found that individuals with low education and those interviewed in Urdu or Hindi did not frequently include high blood pressure, cholesterol, and diabetes in their EMs of CHD. This finding is consistent with other studies that have shown that education [44] and lower acculturation [47,48] may affect disease-related knowledge. Lower education may be a marker for low health literacy. Immigrants who do not speak English may be at risk for lower functional health literacy [49–51]; yet health prevention messages for immigrants are often simply translated into different languages without considering literacy levels [49]. In addition to providing translated materials, CHD education materials should utilize plain language [52] and simple concepts so that messages are accessible to South Asians across education and literacy.

Women in this study were less likely than men to think they were at-risk for CHD. Studies of the general U.S. population have also shown lower awareness of risk among women, particularly minority women [53,54]. A qualitative study of South Asian women in Canada also found that women did not recognize that they were at-risk for CHD [38]. The lower perception of risk among women in our study did not seem related to a lack of knowledge. Women's EMs included behavioral and physiologic concepts of CHD prevention. Some respondents expressed the belief that heart attacks may be caused by a sudden adverse event or by fate, and this belief seemed to influence individual risk perception. Those who did not think they could have a heart attack in the future often said it was because they were not experiencing stress or because the future was in God's hands. Beliefs about fate may contribute to risk perception [55], but there may also be issues related to immigration and gender roles, which have previously been shown to be related to perceptions about control over health [38,56,57]. CHD prevention messages for South Asian women should consider how to communicate the fact that South Asian women are at-risk for CHD and what steps they can take for prevention.

The main limitation of this study is the use of a convenience sample of South Asians from a federally qualified health center and a community center in Chicago. Our sample only included Asian Indians and Pakistanis, and does not reflect the linguistic and cultural heterogeneity of South Asians. Our results may not generalize to South Asians who speak different languages, who are more highly acculturated, live in different regions, and who have a higher SES. Study strengths include a relatively large sample for a qualitative study and the use of an interviewer who is fluent in Hindi, Urdu, and English. This allowed us to interview a segment of the South Asian population that is often hard to reach for health research, including those with limited English proficiency and the uninsured. Prior health studies in the U.S. are limited by the fact that they only included South Asians who are English-proficient [58,59] and with a high SES [1]. Lower SES South Asians may be at even higher risk for CHD since low SES is associated with higher CHD risk and mortality [60,61].

4.2. Conclusion

South Asians' EMs of CHD and prevention focused mostly on stress, diet, and physical activity. South Asians placed less emphasis on cholesterol, blood pressure, diabetes, and smoking as modifiable risk factors for CHD. A significant number of South Asians may also believe that CHD is sudden or not preventable. Prior studies have shown that lower levels of knowledge about CHD are linked to worse risk factor control [62,63]. CHD education messages aimed at South Asians need to change knowledge and attitudes about the preventability of CHD and the importance of modifiable risk factors. However, interventions that address knowledge gaps alone are unlikely to be effective. Interventions are needed to convey to knowledge, motivation, and skills to effectively engage in healthy lifestyle behaviors. Interventions may be more successful if they build on South Asians EMs of CHD; for example, prevention messages may want to acknowledge the belief among some South Asians that prayer is a form of exercise, while also communicating that more vigorous exercise is needed for CHD prevention. Further research is needed to understand if these findings are widespread and replicable in other U.S. South Asian communities. Until then, this study can be used as a starting point to develop CHD prevention interventions for the high-risk South Asian community.

4.3. Practice implications

South Asians may hold multiple belief systems about CHD etiology and prevention, combining a biomedical model with

psychosocial and spiritual beliefs. Clinicians and health educators should elicit South Asian patients' EMs of CHD and consider how to incorporate the patients' EM into the treatment plan. This approach may improve patient-provider communication and clinical care for South Asian patients.

Disclosure

I confirm all patient/personal identifiers have been removed or disguised so the patient/person(s) described are not identifiable and cannot be identified through the details of the story.

Conflict of interest

The authors have no potential conflicts of interest.

Acknowledgements

This study was funded by The National Heart, Lung, and Blood Institute (Career Development Award 5 K23 HL 084177, PI-Dr. Kandula). During the research and writing of this paper Dr. Tirodkar was a post-doctoral research fellow at the Institute for Healthcare Studies, Northwestern University Feinberg School of Medicine, supported by an Advanced Rehabilitation Research Training Award from the National Institute on Disability and Rehabilitation Research Grant (H133P980014). An earlier version of this paper was presented as "Concepts of Health, Disease & Heart Disease among South Asian Immigrants in Chicago" at the Society of General Internal Medicine 31st Annual Meeting, Pittsburgh, on 04/10/08. The authors thank Asian Human Services Family Health Center and Indo-American Center in Chicago, IL for their assistance with data collection.

References

- [1] Enas EA, Garg A, Davidson MA, Nair VM, Huet BA, Yusuf S. Coronary heart disease and its risk factors in first-generation immigrant Asian Indians to the United States of America. *Indian Heart J* 1996;48:343–53.
- [2] Palaniappan L, Wang Y, Fortmann SP. Coronary heart disease mortality for six ethnic groups in California: 1990–2000. *Ann Epidemiol* 2004;14:499–506.
- [3] Anand SS, Xie C, Pare G, Montpetit A, Rangarajan S, McQueen MJ, et al. Genetic variants associated with myocardial infarction risk factors in over 8000 individuals from five ethnic groups: the INTERHEART Genetics Study. *Circ Cardiovasc Genet* 2009;2:16–25.
- [4] Iqbal R, Anand S, Ounpuu S, Islam S, Zhang X, Rangarajan S, et al. Dietary patterns and the risk of acute myocardial infarction in 52 countries: results of the INTERHEART Study. *Circulation* 2008;118:1929–37.
- [5] McQueen MJ, Hawken S, Wang X, Ounpuu S, Sniderman A, Probstfield J, et al. Lipids, lipoproteins, and apolipoproteins as risk markers of myocardial infarction in 52 countries (the INTERHEART study): a case-control study. *Lancet* 2008;372:224–33.
- [6] Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case-control study. *Lancet* 2004;364:937–52.
- [7] Lauderdale DS, Rathouz PJ. Body mass index in a US national sample of Asian Americans: effects of nativity, years since immigration and socioeconomic status. *Int J Obes Relat Metab Disord* 2000;24:1188–94.
- [8] Ye J, Rust G, Baltrus P, Daniels E. Cardiovascular risk factors among Asian Americans: results from a National Health Survey. *Ann Epidemiol* 2009;19:718–23.
- [9] Bainey KR, Jugdutt BI. Increased burden of coronary artery disease in South-Asians living in North America, need for an aggressive management algorithm. *Atherosclerosis* 2009;204:1–10.
- [10] Ferozhi NG, Rumley A, Lowe GD, McKeigue P, Sattar N. Specific elevation in plasma tissue plasminogen activator antigen concentrations in South Asians relative to Europeans. *Blood Coagul Fibrinolysis* 2003;14:755–60.
- [11] McKeigue PM, Shah B, Marmot MG. Relation of central obesity and insulin resistance with high diabetes prevalence and cardiovascular risk in South Asians. *Lancet* 1991;337:382–6.
- [12] Venkataraman R, Nanda NC, Baweja G, Parikh N, Bhatia V. Prevalence of diabetes mellitus and related conditions in Asian Indians living in the United States. *Am J Cardiol* 2004;94:977–80.
- [13] Mensah GA. Eliminating disparities in cardiovascular health: six strategic imperatives and a framework for action. *Circulation* 2005;111:1332–6.
- [14] Kreuter MW, Lukwago SN, Bucholtz RD, Clark EM, Sanders-Thompson V. Achieving cultural appropriateness in health promotion programs: targeted and tailored approaches. *Health Educ Behav* 2003;30:133–46.
- [15] Cameron KA, Francis L, Wolf MS, Baker DW, Makoul G. Investigating Hispanic/Latino perceptions about colorectal cancer screening: a community-based approach to effective message design. *Patient Educ Couns* 2007;68:145–52.
- [16] Kleinman A, Eisenberg L, Good B. Culture, illness, and care: clinical lessons from anthropologic and cross-cultural research. *Ann Intern Med* 1978;88:251–8.
- [17] Milat AJ, Carroll TE, Taylor JJ. Culturally and linguistically diverse population health social marketing campaigns in Australia: a consideration of evidence and related evaluation issues. *Health Promot J Austr* 2005;16:20–5.
- [18] Kreuter MW, McClure SM. The role of culture in health communication. *Annu Rev Public Health* 2004;25:439–55.
- [19] McGuire MB. *Ritual health in Suburban America*. New Jersey: Rutgers University Press; 1988.
- [20] Farmer P. *AIDS and Accusation: Haiti and the Geography of Blame*. Berkeley: University of California Press; 1993.
- [21] Blaxter M. The causes of disease. *Women talking*. *Soc Sci Med* 1983;17:59–69.
- [22] Pill R, Stott NC. Choice or chance: further evidence on ideas of illness and responsibility for health. *Soc Sci Med* 1985;20:981–91.
- [23] Karasz A. Cultural differences in conceptual models of depression. *Soc Sci Med* 2005;60:1625–35.
- [24] Chen Jr MS, Kuun P, Guthrie R, Li W, Zaharlick A. Promoting heart health for Southeast Asians: a database for planning interventions. *Public Health Rep* 1991;106:304–9.
- [25] Cardiovascular Risk in the Vietnamese Community: Formative Research from Houston, Texas. 2000, US Department of Health and Human Services. National Institutes of Health: National Heart, Lung, and Blood Institute.
- [26] Cardiovascular Risk in the Filipino Community: Formative Research from Daly City and San Francisco, California. 2000, US Department of Health and Human Services. National Institutes of Health: National Heart, Lung, and Blood Institute.
- [27] Alcalay R, Alvarado M, Balcasar H, Newman E, Huerta E. Salud para su Corazon: a community-based Latino cardiovascular disease prevention and outreach model. *J Community Health* 1999;24:359–79.
- [28] Smith Jr SC, Blair SN, Bonow RO, Brass LM, Cerqueira MD, Dracup K, et al. AHA/ACC Scientific Statement: AHA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease: 2001 update: a statement for healthcare professionals from the American Heart Association and the American College of Cardiology. *Circulation* 2001;104:1577–9.
- [29] Darr A, Astin F, Atkin K. Causal attributions, lifestyle change, and coronary heart disease: illness beliefs of patients of South Asian and European origin living in the United Kingdom. *Heart Lung* 2008;37:91–104.
- [30] Rankin J, Bhopal R. Understanding of heart disease and diabetes in a South Asian community: cross-sectional study testing the 'snowball' sample method. *Public Health* 2001;115:253–60.
- [31] Rangaswamy P, Kalayil AL. Making Data Count: South Asian Americans in the 2000 Census with Focus on Illinois. Chicago, IL: South Asian American Policy and Research Institute (SAAPRI); 2005.
- [32] Tirodkar, M.A., Baker, D.W., Makoul, G.T., Khurana, N., Paracha, M.W., Kandula, N.R. Explanatory models of health and disease among South Asian immigrants in Chicago. *J Immigr Minor Health*.
- [33] Miles M, Huberman M. 2nd edition, *Qualitative data analysis an expanded sourcebook*. CA: Sage Publications: Thousand Oaks; 1994.
- [34] Strauss A, Corbin J. *Grounded theory in practice*. Thousand Oaks, CA: Sage Publications; 1997.
- [35] NVivo qualitative data analysis software; QSR International Pty Ltd. Version 8, 2008.
- [36] StataCorp, *Stata Statistical Software: Release 9*. 2005, StataCorp LP: College Station, TX.
- [37] Choo V. WHO reassesses appropriate body-mass index for Asian populations. *Lancet* 2002;20:235.
- [38] King KM, LeBlanc P, Sanguins J, Mather C. Gender-based challenges faced by older Sikh women as immigrants: recognizing and acting on the risk of coronary artery disease. *Can J Nurs Res* 2006;38:16–40.
- [39] Srisankharajah J, Kai J. Promoting physical activity among South Asian women with coronary heart disease and diabetes: what might help? *Fam Pract* 2007;24:71–6.
- [40] Netto G, McCloughan L, Bhatnagar A. Effective heart disease prevention: lessons from a qualitative study of user perspectives in Bangladeshi, Indian and Pakistani communities. *Public Health* 2007;121:177–86.
- [41] Kalra P, Srinivasan S, Ivey S, Greenlund K. Knowledge and practice: the risk of cardiovascular disease among Asian Indians. Results from focus groups conducted in Asian Indian communities in Northern California. *Ethn Dis* 2004;14:497–504.
- [42] Warren-Findlow J. Weathering: stress and heart disease in African American women living in Chicago. *Qual Health Res* 2006;16:221–37.
- [43] Woodard LD, Hernandez MT, Lees E, Petersen LA. Racial differences in attitudes regarding cardiovascular disease prevention and treatment: a qualitative study. *Patient Educ Couns* 2005;57:225–31.
- [44] Folsom AR, Sprafka JM, Luepker RV, Jacobs Jr DR. Beliefs among black and white adults about causes and prevention of cardiovascular disease: the Minnesota Heart Survey. *Am J Prev Med* 1988;4:121–7.
- [45] Mosca L, Mochari H, Christian A, Berra K, Taubert K, Mills T, et al. National study of women's awareness: preventive action, and barriers to cardiovascular health. *Circulation* 2006;113:525–34.

- [46] Mosca L, Mochari-Greenberger H, Dolor RJ, Newby LK, Robb KJ. Twelve-year follow-up of American women's awareness of cardiovascular disease risk and barriers to heart health. *Circ Cardiovasc Qual Outcomes* 2010;3:120–7.
- [47] Moreno C, Alvarado M, Balcazar H, Lane C, Newman E, Ortiz G, et al. Heart disease education and prevention program targeting immigrant Latinos: using focus group responses to develop effective interventions. *J Community Health* 1997;22:435–50.
- [48] Hwang SY, Ryan CJ, Zerwic JJ. Korean immigrants' knowledge of heart attack symptoms and risk factors. *J Immigr Minor Health* 2008;10:67–72.
- [49] Garbers S, Chiasson MA. Inadequate functional health literacy in Spanish as a barrier to cervical cancer screening among immigrant Latinas in New York City. *Prev Chronic Dis* 2004;1:A07.
- [50] Kreps GL, Sparks L. Meeting the health literacy needs of immigrant populations. *Patient Educ Couns* 2008;71:328–32.
- [51] Williams MV, Parker RM, Baker DW, Parikh NS, Pitkin K, Coates WC, et al. Inadequate functional health literacy among patients at two public hospitals. *J Am Med Assoc* 1995;274:1677–82.
- [52] Doak CC, Doak LG, Root JH. Teaching patients with low literacy skills, 2nd edition, Philadelphia: J.B. Lippincott; 1996, xii, 212 p.
- [53] Mosca L, Ferris A, Fabunmi R, Robertson RM. Tracking women's awareness of heart disease: an American Heart Association national study. *Circulation* 2004;109:573–9.
- [54] Mosca L, Jones WK, King KB, Ouyang P, Redberg RF, Hill MN. Awareness: perception, and knowledge of heart disease risk and prevention among women in the United States. American Heart Association Women's Heart Disease and Stroke Campaign Task Force. *Arch Fam Med* 2000;9:506–15.
- [55] Johnson JL, Bottorff JL, Balneaves LG, Grewal S, Bhagat R, Hilton BA, et al. South Asian women's views on the causes of breast cancer: images and explanations. *Patient Educ Couns* 1999;37:243–54.
- [56] Choudhry UK. Health promotion among immigrant women from India living in Canada. *Image J Nurs Sch* 1998;30:269–74.
- [57] Meadows LM, Thurston WE, Melton C. Immigrant women's health. *Soc Sci Med* 2001;52:1451–8.
- [58] Ponce NA, Lavarreda SA, Yen W, Brown ER, DiSogra C, Satter DE. The California Health Interview Survey 2001: translation of a major survey for California's multiethnic population. *Public Health Rep* 2004;119:388–95.
- [59] Ye J, Rust G, Baltrus P, Daniels E. Cardiovascular risk factors among Asian Americans: results from a National Health Survey. *Ann Epidemiol* 2009.
- [60] Bhopal R, Hayes L, White M, Unwin N, Harland J, Ayis S, et al. Ethnic and socioeconomic inequalities in coronary heart disease: diabetes and risk factors in Europeans and South Asians. *J Public Health Med* 2002;24:95–105.
- [61] Cooper R, Cutler J, Desvigne-Nickens P, Fortmann SP, Friedman L, Havlik R, et al. Trends and disparities in coronary heart disease, stroke, and other cardiovascular diseases in the United States: findings of the national conference on cardiovascular disease prevention. *Circulation* 2000;102:3137–47.
- [62] Muntner P, DeSalvo KB, Wildman RP, Raggi P, He J, Whelton PK. Trends in the prevalence: awareness, treatment, and control of cardiovascular disease risk factors among noninstitutionalized patients with a history of myocardial infarction and stroke. *Am J Epidemiol* 2006;163:913–20.
- [63] Petrella RJ, Campbell NR. Awareness and misconception of hypertension in Canada: results of a national survey. *Can J Cardiol* 2005;21:589–93.