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Research Article

Validation of a Questionnaire for Assessment of Happiness, with Reference to Social Classes among Indians

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Abstract

Background: Cohort studies indicate that the risk of chronic anxiety, aggression and depression may vary according to social class and grade of happiness, which may predispose poor physical health, leading to cardio-metabolic diseases (CMDs). The most important attribute of happiness is satisfaction, which may also vary according to social classes. This study aims to validate a questionnaire for assessment of happiness to find out the association of happiness with social classes.

Subjects and Methods: After written informed consent and approval from hospital ethic committee, this cross-sectional survey was conducted at Halberg Hospital and Research Institute, Moradabad, India. All subjects; 980 urban (495 men and 485 women), 900 rural (510 men and 390 women) above 25 years of age were randomly selected and recruited from urban and rural populations. Clinical data as well as risk factors were recorded with the help of case record form and validated questionnaires. Assessment of happiness was made by a new modified validated questionnaire for assessment of happiness with attributes related to social, psychological and spritual behaviors. Social classes were assessed based on attributes of occupation, housing, per capita income, consumer durables, education. and health education.

Results: The findings reveal that this modified questionnaire can be successfully validated for assessment of happiness. The overall prevalence of happy and satisfied people, among both urban and rural populations, combined, was significantly high (62.8% (n = 1181) vs 37.2% (n = 699), P < 0.01) compared to total of unhappy or neutral subjects, respectively. Among both urban and rural populations, the overall prevalence of happy and satisfied subjects were also independently, significantly greater among urban (62.4% vs 37.5%, P < 0.01) and rural (62.8% vs 37.2%, P < 0.01) populations, compared to unhappy or neutral subjects. The prevalence of grades of happiness; very happy and satisfied, moderately happy and satisfied and modestly happy and satisfied, were independently, significantly lower among both urban and rural subjects compared to unhappy or neutral subjects. In both urban and rural subjects, the prevalence of happiness was significantly greater among subjects in social class 2 to social class 4, compared to social class 1 and social class 5, respectively; urban, 567, (71.9%) vs 152 (48.2% and n = 52 (53.0%), P < 0.01) rural; n = 508, (73.8%) vs n = 150 (49.8%) and n = 44 (48.3%), P < 0.01). The overall prevalence of happiness was also significantly greater among social class 2 to 4 than other social classes. The trend of prevalence of happiness in various social classes from social class 1 (highest) to social class 5 (lowest) was non-significant. The frequency of CAD was significantly lower among subjects with happiness compared to subjects without happiness, respectively both in urban (n = 31 (5.06% vs 45 (12.2%, p < 0.02) as well as among rural populations, respectively (n = 14 (2.09%) vs n = 13 (3.92%, P < 0.05). The overall prevalence of CAD among urban subjects was 7.75% (n = 76) and among rural 3.0% (n = 27) and the difference was significant (P < 0.02). The prevalence of CAD was significantly more common among higher social classes 1 - 3, compared to lower social classes 4 and 5, respectively (n = 88 (5.95%) vs n = 15 (2.88%), P < 0.01). There were no gender differences in prevalence of happiness.

Conclusions: It is clear that this modified questionnaire can be successfully validated for assessment of happiness among various social classes. The questionnaire allowed us to identify overall 62.8% (n = 1181) subjects with happiness, including in social class 1

to 5. Happiness was significantly greater among social class 2 to 4, compared to social class 1 and 5 subjects, among both urban and rural subjects. The prevalence of CAD was significantly more common among higher social classes 1 - 3, compared to lower social classes 4 and 5 among both urban and rural populations.

Keywords: *Western Diet; Sedentary Behavior; Mastication; Cardiovascular Diseases*

Introduction

"There is no path to happiness, happiness is the path", said Buddha ages ago [1]. However, a new survey tries to demystify the true determinants of happiness, which may not be absolutely correct in view of knowledge enlightened by Buddha, s Eight Fold Path [1]. This global survey by Ipsos in India showed that happiness has ranked 9th in the pecking order on happiness, among 28 nations polled (IPSOS, https://www.ipsos.com/en-in/india-ranks-9th-happiness-among-28-global-markets-ipsos-global-happiness-survey accessed December 1, 2019). This survey revealed that the highest prevalence of happiness is found in developed nations (86%) such as Australia and Canada, followed by China (83%), Great Britain (82%), France (80%), USA (79%), Saudi Arabia (78%) and Germany (78%) compared to 76% in India. The survey was conducted by non-medical experts and the criteria of happiness were limited which are open to criticism but the attempt made is excellent [2].

It seems that happiness may be an important component of total health, including physical, social, emotional and spiritual wellbeing of the subjects and of population health. Happiness may inhibit stress hormones by inducing happiness hormones leading to prevention of cardio-metabolic diseases (CMDs) and neuro-psychiatric diseases [3-9]. It is clear that the criteria of happiness are not confined to economic development, personal safety and living conditions because in India, all these attributes are very much lacking compared to Argentina, Spain and Russia, having lower levels of happiness [2]. It is important to find out the factors responsible for happiness in Indians, because economic development alone should not be the major determinant of happiness [2]. It is possible that what Lord Buddha said, ages ago, "happiness is the path" may be correct for Indians [1].

It seems that unhealthy behaviors and attitudes as well as cultural factors involve progressive decline in physiological functions, immunological functions, neuroendocrine dysfunction, cognition and attitudes towards healthy behaviors and health [3-7]. These behaviors appear to be important in determining happiness and well-being of the mind that are important components of spiritual as well as psychological health, which determine total health [7]. There is concurrent and temporal relationships between humility and emotional and psychological well-being which may be important for determining and maintaining happiness [10]. Dreaming of a brighter future leading to anticipation of happiness may instill meaning in life which may be protective for health promotion [11]. There is consistent evidence from cohort studies, that type A behavior, aggression, mood disorders and depression as well as chronic anxiety disorders can predispose poor social and physical health leading to CMDs [3-7]. However, active prayer, yoga therapy, moderate physical activity, mindfulness, Mediterranean type diets, probiotics, mastication during eating and optimism can provide improved psychological health and wellbeing, as well as prevention of CVDs and diabetes [3-7]. Dopamine, serotonin, oxytocin and endorphins are the quartet neurotransmitters responsible for the happiness and cortisol for stress related disorders [9,12]. It is proposed that the risk of chronic anxiety disorders, mood disorders and depression, as well as aggression may vary in different social classes, which may be reduced by inculcation of happiness. This possibility prompts us to develop and validate a questionnaire for assessment of happiness in relation to socioeconomic status (SES). Our strategy is to find out, if this questionnaire could be used for assessment of happiness in epidemiological studies, as well as in clinical trials to find out the effects of intervention on happiness.

Aim of the Study

This study aims to validate a questionnaire for assessment of quality of happiness in relation to social classes and to find out if happiness may be associated with lower frequency of coronary artery disease (CAD).

Subjects and Methods

After written informed consent and clearance from institutional ethic committee, recruitment of subjects was made at Halberg Hospital and Research Institute, Moradabad, India. Randomly selected samples of subjects, aged 25 years and above were obtained from apparently healthy urban and rural populations, based on voters list [13]. If the random number fell to a subject, who was < 25 yrs or

not available, it was assigned to next person in the list. In this study, we contacted 2422 urban and 1769, rural subjects from few villages. Among all subjects aged 25 years and above, approximately, 9% refused to participate and rest gave their consent to be to be included in the study. Of all the subjects; 980 urban (495 men and 485 women), 900 rural (510 men and 390 women) above 25 years of age were randomly selected for assessment of happiness.

Collection of data

Case record form was completed to record clinical data such as age, sex, body weight, height, waist circumference, past and family history of diseases in all the subjects. Validated questionnaires were used to examine behavioral factors, tobacco and alcohol intake, diet and lifestyle factors and social classes as well as type A behavior, mood disorders and depression [13-18].

Criteria of happiness

Happiness was assessed by a new questionnaire modified from earlier questionnaires based on subjective feeling without consideration of other behaviors [10,19-22]. The happiness scale was also referred to as the Emotion Questionnaire as it assesses emotional wellbeing as an indication of perceived happiness [10]. It is comprised of two items; the first is a scale measuring happiness/unhappiness by participants ranking descriptive phrases on a 0 - 10 scale. However, this questionnaire used in our study comprised of 15 items, These items make up the test requires participants to give an approximate percentage of time or number of times that he/she feels about the attributes indicating happy, unhappy and neutral which are based on a scale of 0 - 15. Attributes of social classes are also included, to assess the role social class in happiness. This questionnaire was validated among 100 subjects (n = 50 in each of urban and rural subjects) before it is used for assessment of happiness the test show adequate reliability and validity because many behavioral confounders have been included as attributes of happiness (Appendix 1).

Attributes of happiness: Scores	0	1	2	3	4	5	6	7	8	9	10
1. Right, Understanding (Think for universal benefits)											
2. Right Intent, (Good intention for people and self)											
3. Right Speech. (Speak truth, not unpleasant to others)											
4. Right Action, (Do right things without harm to others) healthy behaviors; prayer, yoga, physical activity.											
5. Right Livelihood. (Occupation with no harm to others, and self, satisfaction with income, status, no night shift)											
6. Right Effort. (Make efforts without harming others)											
7. Right Mindfulness. (Speak with full attention and feeling of goodness) optimism.											
8. Right Concentration. (Concentrate, pray and meditate to allay bad thoughts, optimism).											
9. Right eating. (Eat healthy foods with mastication).											
10. Right time of eating. (Eat before sun set).											
11. Life satisfaction and wellbeing. optimism.											
12. Perceived quantity of happiness and duration of happiness including sexual activity, cuddling etc in 24 hours on a scale of 0-10.											
13. Social class grade											
14. Prosperity and position											
15. Health education											

Appendix 1: *Study of healthy lifestyle, and behavior, life satisfaction, wellbeing and behaviors as attributes of happiness, based on references 2, 5-9. (modified from happiness rating scale for Indians reference 2).*

Total score = 101 - 150; Very satisfied and very happy; Total score = 51 - 100; moderately satisfied and happy and Total score = 21 - 50; modestly satisfied and happy and Total score < 21 = Neutral. (Highlighted- proven).

Criteria of diagnosis of other behaviors and risk factors and diseases were based on WHO criteria and on previous studies [2,13-18]. Sedentary behavior was considered in presence of no spare time physical activity, and walking less than 14.5 Km/week, climbs fewer than 20 flights of stairs a week or performs no moderate physical activity (< 300 K calories /day) on 5 days a week [15]. Socioeconomic status

(SES) was assessed based on attributes of occupation, housing, use of consumer durables like car, scooter, bike, per capita family income and education as well as health education [13-18]. Per capita family income was calculated by finding out the total income of the family divided by total number of family members. Education was considered on the individuals has crossed 1 - 12 year of education in a school. Knowledge on health education was considered when the subjects knew that physical activity, cessation of tobacco, moderation in alcohol intake are good for health and should be used for prevention of CVDs and diabetes.

Physical examination

Criteria of diagnosis of risk factors were based on WHO criteria for all the risk factors and diseases. Body weights and heights were measured in underclothes. Body weight was measured in kilo grams up to minimum of 0.5 Kg by a calibrated weighing machine. Height was measured in centimeters after removing shoes asking the subject to stand on his back side, close to measuring stand. Body mass index (BMI) was calculated and obesity was defined as a BMI of 30 kg/m^2 and above, overweight when body mass index 25 kg/m^2 to 29.9 Kg/m^2.

A 12 lead electrocardiogram was done in all the subjects. The criteria for the diagnosis of coronary artery diseases (CAD) were based on WHO criteria: (a) history of angina or infarction and previously diagnosed disease, (b) affirmative response to Rose questionnaire and (c) electrocardiographic findings, namely Minnesota codes 1-1, 4-1, 5-9, 5-2 or 9-2. Presence of all of these three criteria was taken as confirmation of the diagnosis of CAD. Individual clinical criteria included known CAD, affirmative response to Rose questionnaire and electrocardiographic changes (Q wave change codes 1-1 and 1-2, ST segment depression or elevation codes 4-1, 4-2 and 9-2 and T wave inversions, codes 5-1 and 5-2. Prevalence rates of these electrocardiographic finding with and without clinical criteria for CAD are also given.

Statistical analysis

The prevalence rates are given in percent and continuous variables as mean 1 standard deviation. Subjects were classified based on grade of happiness, and the association of various grades of happiness with social classes. Significance were demonstrated by Chi square test. Only p values < 0.05 with two tailed t test are considered significant.

Results

This study included 980 urban (50.5% males) and 900 rural (53.6% males) subjects. Mean age among urban (44.5 (10.5) vs 42.6 (9.5) years) and rural subjects showed no significant difference, respectively. Mean body weights (61.8 (11.7) vs 56.7 (8.9) Kg) and body mass index (22.5 (2.3) vs 21.6 (1.9) Kg/m^2) among urban subjects were significantly higher compared to rural subjects respectively (Table 1).

Data	Urban subjects (n = 980)	Rural subjects (n = 900)
Sex-males, n (%)	495 (50.5%)	510 (53.6%)
Mean age-years	44.5 (10.5)	42.6 (9.5)
Mean body weight, Kg	61.8 (11.7)*	56.7 (8.9)
Mean body mass index, Kg/m^2	22.5 (2.3)*	21.6 (1.9)
Blood pressures (mm Hg):		
Systolic	123.4 (14.8)*	116.7 (9.9)
Diastolic	82.7 (10.7)*	78.6 (7.8)

Table 1: *Clinical data among urban and rural subjects. Values are mean (standard deviation).*

Table 2 shows the grades of happiness among urban and rural subjects. The overall prevalence of happy and satisfied people, among both urban and rural populations, combined, was significantly high (62.8% (n = 1181) vs 37.2% (n = 699), P < 0.01) compared to total of unhappy or neutral subjects, respectively. Among both urban and rural populations, the overall prevalence of happy and satisfied subjects were also independently, significantly greater among urban (62.4% vs 37.5%, P < 0.01) and rural (62.8% vs 37.2%, P < 0.01) populations, compared to unhappy or neutral subjects. The prevalence of grades of happiness; very happy and satisfied, moderately happy and satisfied and modestly happy and satisfied, were independently, significantly lower among both urban and rural subjects compared to unhappy or neutral subjects (Table 2).

The prevalence of happiness was significantly greater among subjects > 45 years among both urban and rural populations compered to subjects between 25 to 45 years and the trend was significant, as reported earlier [2]. The overall prevalence of happiness above 45

Grades and Scores of happiness	Urban subjects, (n = 980)	Rural subjects (n = 900)	Total, n = 1880
Very happy and satisfied, 101 - 150	201 (20.5)*	210 (23.3)*	411 (21.8)*
Moderately happy and satisfied, 51 - 100	211 (21.5)*	201 (22.3)*	412 (21.9)*
Modestly happy and satisfied, 21 - 50	200 (20.4)*	158 (17.5)*	358 (19.4)*
Total	612 (62.4)*	569 (63.2)*	1181 (62.8)*
Unhappy or Neutral, < 21	368 (37.5)	331 (36.8)	699 (37.2)

Table 2: *Grade of happiness based on scores, among urban and rural subjects.*

** = P < 0.01, p values were obtained by Chi square test. Values are number (%).*

Total score = 101-150; Very satisfied and very happy; Total score = 51-100; moderately satisfied and happy and Total score = 21-50; modestly satisfied and happy and Total score < 21 = Neutral.

years (n = 628 vs 553 (65.7% vs 48.2%, P < 0.01) was also significantly greater among subjects above 45 years of age compared to subject below 45 years.

The prevalence of happiness according to SES is given in table 3. In both urban and rural subjects, the prevalence of happiness was significantly greater among subjects in social class 2 to social class 4, compared to social class 1 and social class 5, respectively; urban, 567, (71.9%) vs 152 (48.2% and n = 52 (53.0%), rural; n = 508, (73.8%) vs n = 150 (49.8%) and n = 44 (48.3%) (Table 3). The overall prevalence of happiness was also significantly greater among social class 2 to 4 than other social classes (Table 3). The trend of prevalence of happiness in various social classes was non-significant.

Social class	No	Urban (n = 612) Happy (n %)	No	Rural (n = 669) Happy (n %)	No	Total (n = 1181)Happy (n, %)
Social class 1	315	152 (48.2)	301	150 (49.8)	616	302 (49.0)
Social class 2	206	141 (68.4)*	182	122 (67.4)*	388	263 (67.8.)*
Social class 3	188	123 (65.4)*	168	123 (73.2)*	356	246 (69.1)*
Social class 4	173	144 (83.2)*	158	130 (82.2)*	331	274 (82.8)*
Social class 5	98	52 (53.0)	91	44 (48.3)	189	96 (50.8)
Chi square trend		54.5		43.1		70.7
Total	980	612 (62.44%)	900	569 (63.22)	1880	1181 (62.82)

Table 3: *Prevalence of happiness according to social classes among urban and rural subjects.*

*Values are n (%), * = p < 0.01, P values were obtained by Chi square test by comparing percentages of dementia according to social classes.*

Frequency of CAD among subjects with happiness

The frequency of CAD was significantly lower among subjects with happiness compared to subjects without happiness, respectively both in urban (n = 31 (5.06% vs 45 (12.2%, p < 0.02) as well as among rural populations, respectively (n = 14 (2.09%) vs n = 13 (3.92%, P < 0.05). The overall prevalence of CAD among urban population was 7.75% (n = 76) and among rural 3.0% (n = 27) and the difference was significant (P < 0.02). The prevalence of CAD was significantly more common among higher social classes 1 - 3, compared to lower social classes 4 and 5, respectively (n = 88 (5.95%) vs n = 15 (2.88%), P < 0.01).

Discussion

This study shows that this modified questionnaire can be successfully used in various social classes, for assessment of happiness rates in urban and rural areas of north India. As given in table 2, this questionnaire, can identify the prevalence of happiness among urban populations which are dominated by higher social classes 62.4% (n = 612), as well as in rural subjects 63.2% (n = 569) dominated by rural social classes, with overall prevalence of happiness of 62.8% (n = 1181) subjects. The prevalence of happiness was significantly greater among subjects in social class 2 to 4, compared to social class 1 and 5, respectively; urban, 567, (71.9%) vs 152 (48.2% and n = 52 (53.0%), rural; n = 508, (73.8%) vs n = 150 (49.8%) and n = 44 (48.3%) (Table 3). The overall prevalence of happiness and satisfied people was also significantly greater among social class 2 to 4 than other social classes (Table 3). The trend of prevalence of happiness in various social classes was non-significant, indicating that social class may not be a determinant of happiness.

There are only a few studies on prevalence of happiness among randomly selected subjects and there is no study to find out the role of social class in the physio-pathogenesis of happiness. In a cross-sectional survey from Finland, Poland and Spain, among 10 800 adults, experienced well-being was measured using the Day Reconstruction Method and evaluative well-being, measured with the Cantril Self-Anchoring Striving Scale. The results showed that respondents with younger age (effect size, β = 0.19), higher levels of education (β = −0.12), a history of depression (β = −0.17), poor health status (β = 0.29) or poor cognitive functioning (β = 0.09) revealed worse well-being experience. Male sex (β = −0.03), not living with a partner (β = 0.07), and lower occupational (β = −0.07) or income levels (β = 0.08) were also associated with poor wellbeing. After controlling for age, depression, income and other sociodemographic variables, status of health was most strongly correlated with wellbeing indicating that strategies to improve population health may improve wellbeing of population [19]. In another study from Poland (1991 - 2015) and Russia (1994 - 2014) Brzezinski investigated the microeconomic determinants of declines in unhappiness rates observed in the studied periods in Poland (a 56% fall in unhappiness) and Russia (a drop in the range from 46 to 75% depending on the unhappiness threshold chosen) [20]. The results indicate that unhappiness reductions in both countries were mostly driven by effects of coefficient, rather than characteristics which had minimal role. In both countries, financial gains accounted for about 15% of the total decline in unhappiness. These effects were doubled by growing return to income with unemployment, as unhappiness-increasing factor in Russia. However, in Poland income has been losing protecting power and in overall, income showed no effect on increase in unhappiness. In case of Poland, good self-rated health and having children explains additional 15 - 20% of the happiness observed in this country [20]. This finding is similar with results in our study showing that lower social classes among both urban and rural populations had lower prevalence of happiness. The reason for lower prevalence of happiness and satisfied people in the social class 1 could be increased risk of CAD, and possibly other related diseases as well as competition in profession and business among them. Some investigators have proposed that decreasing misery can be a new strategy for increasing happiness among people [21].

A recent study published in 2017, among 190 teachers, demonstrated the validity and reliability of the Turkish Version of the Orientations to Happiness Scale [22]. Results of confirmatory factor analysis reported that the nine items were loaded on three factors; meaning, pleasure, internal consistency reliability and engagement. These results emphasized that the Turkish Version of the Orientations to Happiness Scale is a valid and reliable instrument [22]. However, in this happiness scale, there was no consideration for many behavioral factors which may be related to social, emotional and spiritual health and happiness and with neuro-hormones [23,24]. In the global happiness index, the highest determinants of happiness were; physical health/wellbeing (88%), living conditions (86%), hobbies/interests (85%), personal safety/security (85%), feeling that life has meaning (85%), feeling in control on life (84%), satisfaction (84%), having more money (84%) and friends (83%) [25,26]. The World Happiness Report 2018 is a survey of the state of global happiness that includes ranking of 156 countries, by their happiness levels, and 117 countries by the happiness of their immigrants [25]. This report shows that India has slipped 10 ranks; from 123 to 133 compared to last year. Finland tops the list of 156 countries ranked, pushing last year's winner Norway to second position. Pakistan (75) is above India, and so is China (86). While Bangladesh and Sri Lanka are at 115 and 116 positions, respectively, Nepal stands at 101 and Bhutan at 97 [25]. According to a 2019 report on happiness index, positive affect is generally falling in Western Europe, and falling and then rising in both Central and Eastern Europe [26]. It seems that the pattern of partial convergence of positive affect between the two parts of Europe leaves positive affect still significantly more frequent in Western Europe. The incidence of positive affect is falling in Americas, fairly stable and at similar levels in East and Southeast Asia, while starting lower and falling significantly in South Asia [26]. It is possible that rapid increase in risk factors and CMDs may be one important cause for decline in the prevalence of happiness in South Asia [13-18,27,28]. A recent study reported the prevalence of perceived happiness and life satisfaction among 12, 610 subjects aged 15 - 24 years, in Malawi [29]. A descriptive and multivariable regression analysis revealed that more than 80% of the men and women reported being satisfied about life along with happiness and health. Ethnic disparities in perceived happiness and status of health were greater among men, whereas that of life satisfaction was more pronounced in women. Housing in highest wealth quintile was positively associated with health and life satisfaction, but not with happiness. The findings of this survey indicate the need for priority in relation to psychosocial needs of the populations in designing health and social policy in Malawi [29]. It is clear that economic status alone in the form of luxurious housing is not the sole criteria of happiness.

It should be noted that our questionnaire is different from existing questionnaires because it includes 15 attributes related to social class and behavioral factors; optimism, prayer, yoga practice, occupational physical activity, no shift work, meditation, Mediterranean diet, mastication, no night time eating, life satisfaction and wellbeing, as well as perceived happiness with quantity and duration of happiness in a day on a scale of 0 - 15 (Appendix 1). In other questionnaires, satisfaction in life, position in society, health status and economic status are major attributes of happiness, which do not cover emotional and spiritual wellbeing [1,2,19,20-23,29]. Therefore, our questionnaire appears to be more accurate and specific for the assessment of multiple dimensions of happiness attributed by emotional, physical, social

and spiritual behaviors that are indicators of self-health, being human and harmony. In the earlier publication, our study also revealed that among subjects with happiness, the frequency of moderate alcohol intake was significantly greater compared to subjects with no happiness among urban urbans [2]. The prevalence of CAD was significantly lower among subjects with happiness compared to those with no happiness, respectively both in urban (5.06 vs 12.2%, P < 0.01) and rural populations (2.09% vs 3.92%, P, 0.05) indicating that happiness may be protective against CAD without any gender differences. Happiness may also be under influence of the social determinants of health and life outcomes have been gaining widespread attention in public health including psychological health, and sociology, environment and international development. These factors are broadly classified to encompass the cultural, behavioural, social and environmental aspects of health, quality of life, and well-being, especially among the adult population, because happiness of mind depends on these factors [7,9,19,20,29]. Life satisfaction as a component of happiness also favours reproduction [38]. Western style diets, eating late in the night, short sleep, sedentary behavior, low cognitive work and depression as well as tobacco intake and alcoholism are behavioral risk factors [7,9]. These risk factors may influence many of the attributes of happiness and adversely affect neuro-hormones; cortisol and catecholamines release that are damaging to target organs resulting in the neurodegenerative diseases and CMD [7,9,39-44].

Clinical experimental studies indicate that behavioral factors such as laughing, feeling of pleasures, sexual activity, containment and satisfaction may be associated with increase in neuroendocrine hormones [7-12,16,22,23]. However, aggression, depression and humiliation may be associated with increase in cortisol and decline in serotonin resulting in to insulin resistance and endothelial dysfunction [9,10,16,30]. Other studies indicate that apart from happiness, other protective behaviors; prayer, religious service attendance, yoga therapy may be protective against psychological disorders as well as CMDs [32-37]. Thus, evidence from neuroscience, paired with evidence from the measurement of subjective well-being, or happiness, suggest that a scientific explanation of happiness is, in fact, possible [35]. The effects of happiness on brain and of brain dysfunction induced psychological disorders and CMDs appear to be bidirectional. This means that happiness may inhibit brain dysfunction leading to decline in psychological disorders and CMDs, whereas increase in brain dysfunction may predispose lack of perceived happiness resulting in to depression, anxiety and aggression leading to CMDs. Therefore, we may agree with the quotation that "there is no path to happiness, happiness is the path".

Mechanisms

The mechanism for beneficial effects of happiness on health may be; that happiness may be associated with increased release of endorphins, dopamine, serotonin and oxytocin which may inhibit the release of stress hormones, cortisol and catecholamine and glucocorticoids which are known to influence certain neuronal circuits regulating pleasure and happiness [8,9]. The role of the neuroendocrine brain for health and happiness has become clear since the 1960s [23,24]. A novel model proposed by Geoffrey W Harris indicate that brain controls the secretion of anterior and posterior pituitary gland hormones through, respectively, releasing factors secreted into the hypothalamic-hypophysial portal system, and directly from axon terminals into the systemic circulation. This hypothesis allowed the chemical characterization of the posterior pituitary hormones, oxytocin and vasopressin, the releasing factors, their receptors and genes [24]. It has been possible to locate the neurosecretory neurons in the hypothalamus, and how their activity is controlled, including by neural and hormonal feedback, and how hormone rhythms are generated. These neurons and their peptides in the brain are found to be important in reproductive and social behaviours, emotions and appetite. The important features are plasticity and epigenetic programming of neuroendocrine systems which can influence behavioral factors.

Previous studies indicate that acute stress responses promote adaptation and survival via responses of neural, cardiovascular, autonomic, immune and metabolic systems which may become chronic due to other environmental factors [7,9]. Emotional stress that begins in the brain may induce increase in stress hormones, which may have adverse effects on happiness and health and may trigger emotional diseases as well as other CMDs [9,12,16,30]. Therefore, it is important to understand the adaptive and damaging effects of stress and stress mediators because they inhibit the inculcation of happiness and may predispose CMDs [9-12,16,30]. A positive role of lifestyle and behaviors, that are known to influence stress hormones, subjective health, and quality of life have also been observed among Chinese men living with type 2 diabetes [31].

The hypothesis is that holistic manipulations, such as Mediterranean style diets with probiotics, mastication during eating, intermittent fasting and caloric restriction, physical activity, yoga therapy, meditation and prayer along with other positive behaviors like optimism and social support may be an important complement to happiness [7,45-50]. This scale needs to be reproduced by other investigators, for assessment of happiness (Appendix 1) in other populations. There is a need to study the role of biomarkers; endorphins, serotonin, oxytocin, dopamine and melatonin as underlying mechanisms of happiness [45-50]. While glucocorticoids and cortisol associated with

unhappiness are pro-inflammatory and predispose cellular damage, the biomarkers associated with happiness may be anti-inflammatory and protective to cells [51-56].

Neuroimaging studies by functional Magnetic Resonance imaging (fMRI) and PET have demonstrated that brain regions such as hippocampus, prefrontal cortex and amygdala and hypothalamus respond to acute and chronic stress [57-65]. These changes in morphology and chemistry of the neurons may possibly reversed by inculcation of happiness, if the chronic stress lasts for weeks [7,9]. However, it is not clear whether prolonged stress for many months or years may have irreversible effects on the brain. The adaptive plasticity of chronic stress involves many mediators, including glucocorticoids, excitatory amino acids, endogenous factors such as brain derived neurotrophic factor (BDNF), poly-sialated neural cell adhesion molecule (PSA-NCAM) and tissue plasminogen activator (tPA) [12]. The role of this stress-induced remodeling of neural circuitry is not well known in relation to psychiatric illnesses, as well as chronic stress and the concept of top-down regulation of cognitive, autonomic and neuroendocrine function. It seems that policies of government and the private sector play an important role in this top-down view of minimizing the burden of chronic stress and lifestyle factors, sedentary, tobacco, alcohol, aggression etc. and related NCDs to achieve sustainable development goals of the UNO.

Experimental study in monkey via linear systems analysis on a trial-by-trial basis showed that the impulse response of the neurovascular system to a stimuli, is both animal- and site-specific, and that local field potential yield a better estimate of blood oxygen dependent fMRI responses than the multi-unit responses [60]. These findings suggest that the blood oxygen dependent contrast mechanism of fMRI reflects the input and intracortical processing of a given area, rather than its spiking output. The brain is the central organ of the stress response and determines what is stressful, as well as the behavioral and physiological responses to potential and actual stressors. The brain is also a target of stress and it changes structurally and chemically in response to both acute and chronic stressors [12,57-70]. Glucocorticoids play a role in these changes, but there are other mediators; endorphins, serotonin, dopamine and oxytocin as well [8-12]. Although glucocorticoids and catecholamines are the two defining hormones of the "fight or flight" stress response, there are many other mediators, such as pro- and anti-inflammatory cytokines and the parasympathetic nervous system, that are also involved in the in stress by releasing acetylcholine and nitric oxide that provide anti-inflammatory effects.

Limitations of the Study

In our study, more time should have been given to find out exact details of all the behaviors. Multivariate regression analysis should have been conducted to find out the association of risk factors and protective factors with happiness. This survey needs more accuracy via conducting a cohort study for confirmation of our findings because the finding have to be used to educate the policy-makers about the factors that can affect the well-being of populations. Health and wellbeing are interconnected because each can influence the other. Good health may be associated with wellbeing and happiness, whereas presence of diseases or disability may provide negative effects leading to unhappiness and depression [55-60]. The Commission on the Measurement of Economic Performance and Social Progress recommended shifting emphasis from measuring economic production to measuring people's well-being and that this measurement be done at a country level. The Better Life Initiative, launched by the Organisation for Economic Co-operation and Development, has a major objective of measuring the progress of people across eleven attributes of well-being, such as life satisfaction, health, education and environment. Efforts are also being made at the national level in many countries.

Further cohort studies randomized, controlled trials may distinguish differences in ways of assessment of well-being and happiness, which may include asking people to evaluate their life. It may be called evaluative well-being. Other method may be to ask subjects to narrate the positive and negative emotions that they experience day-to-day which may be called experienced happiness. Evaluation of happiness may refer to overall evaluation of the subject indicating the quality of his or her life. Experiencing happiness captures the positive and negative emotions that people experience from one moment to another moment which are relevant, because these do not necessarily have the same correlates. High income subjects report more satisfaction with their lives when their evaluative happiness is assessed but the same subjects may not express better experienced happiness due to various social and occupational problems and due to presence of diseases as noted among social class 1 subjects of this study. Some of the life circumstances, such as occupation, marital status and education, may also be more strongly correlated with evaluative than experienced happiness. Knowledge of health education along with general education may be an important determinant of happiness because people in social class 1 and 2 may be more educated but they may not be health educated (Table 3). However, presence of diseases, caring for an adult, loneliness and smoking have been reported to be strong predictors of low experienced happiness as observed in our study. The correlation between health status and evaluative and experienced

happiness indicate that CAD was associated with reduced perceived happiness in this population. Public health research and policy in the developing world are generally disease-oriented, with the focus being largely confined within the biological determinants of health. There has been only little attention given to developing a more health-oriented approach by emphasizing the psychosocial dimensions of health and happiness, especially among the younger population.

In brief, our study shows that this modified questionnaire can accurately identify happiness in relation to social classes. However, social class has not been found to be determinant of happiness because happiness was significantly lower among subjects in social classes 1 and 5 compared to social class 2 to 4. The prevalence of happiness is quite high in India, despite it is a lower middle income country. The cause of lower happy and satisfied people among social class 1 may be increased risk of CAD, whereas among lower social class 5, it may be possibly chronic infections like tuberculosis and chronic obstructive pulmonary disease. This modified questionnaire may be successfully applied for assessment of happiness rates in urban and rural areas among various social classes 1 to 5. The prevalence of CAD was significantly more common among higher social classes 1-3, compared to lower social classes 4 and 5, respectively. The questionnaire allowed us to identify overall 63.2% (n = 569) subjects with happiness, including 62.4% among urban and 63.2% (n = 569) among rural subjects. Further analysis is necessary to confirm our findings.

Conclusion

It is clear that this modified questionnaire can be successfully validated for assessment of happiness among various social classes. The questionnaire allowed us to identify overall 62.8% (n = 1181) subjects with happiness, including in social class 1 to 5. Happiness was significantly greater among social class 2 to 4, compared to social class 1 and 5 subjects, among both urban and rural subjects. The prevalence of CAD was significantly more common among higher social classes 1 - 3, compared to lower social classes 4 and 5 among both urban and rural populations.

Conflict of Interest

Conflict of interest has not been declared by any of the authors.

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Authors Contributions

All the data were collected by Dr RBS and MAN others Dr JF, VM, AI, NR, MD, SW helped in writing of the manuscript.

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