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*Original Article*

# Evaluation of Health Related Quality of Life and Components of Metabolic Syndrome among Young Adults

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## ABSTRACT

**Background:** Metabolic syndrome (MetS), clustering of different cardiac and metabolic risk factors may affect health-related quality of life (HRQL). The aim of the present study was to investigate the association between components of cardio-metabolic risk and health-related quality of life in young adults. **Methodology:** Two hundred and sixteen (216) male and female young adults (18-25 years) were evaluated by using harmonized criteria for MetS (H_MS); HQRL was evaluated by using the SF-36 questionnaire. **Results:** The subjects in the MetS group reported lower scores in almost all subscales of quality of life. In the sex-specific analysis of both young male and female subjects showed significant differences in the mean scores of physical functioning (PF) and general health (GH) between subjects with and without MetS. Compared with men, women with MetS showed significantly lower values in role emotional (RE) subscale. PF correlated significantly with both systolic and diastolic blood pressure in young males with MetS whereas young females showed no significant correlation with PF. Similarly, GH significantly correlated with BMI and TG level in male subjects but females showed no significant correlation. **Conclusion:** Presence of risk factors for metabolic syndrome at the young age have a minimal effect on quality of life during the period.

**Key words:** MetS, HRQL, PF, GH, TG, BMI.

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## INTRODUCTION

Clustering of metabolic disturbances, including central obesity, hyperglycemia, dyslipidemia and hypertension is termed as metabolic syndrome (MetS). It is evident that people with MetS are at increased risk of future development of cardiovascular diseases and type II diabetes mellitus.[1] An expert group from International Diabetes Federation (IDF), National Heart, Lung, Blood Institute (NHLBI), World Health Federation and other International associations proposed a harmonized definition (H_MS) for individuals with metabolic syndrome (MetS) where there are uniform cut off points for all the risk factors like waist measurements, serum triglyceride level, serum high density lipoprotein – cholesterol level, arterial blood pressure and fasting blood glucose level.[2] The aetiology and interplay of different risk factors of MetS is yet to be evaluated entirely. Recent findings suggest that the condition is associated with an increased risk for psychiatric co-morbidity, stress and impaired health related quality of life (HRQL).[3]

"Health-related quality of life" (HRQL) trigger attention in research within the medical and caring sciences now-a-days.[4] HRQL, can be summarized as a multidimensional psychological construct, which encompasses physical, psychological, social and functional areas of life and the impact of health and illness on these scales. It is often used to evaluate the outcome of different physical and mental burden of various diseases.[5] However, most of the HRQL research are centered on adults. Due to lack of standardized data and validated instruments, the young individuals are almost overlooked for HRQL research so far.[6] Studies on general populations including samples from young adults often report data aggregated into large age groups, making it impossible to sort out information for adolescent and young adults.

Association of MetS with many factors are being studied broadly, but reports on the association between MetS and HRQL at the population level are very few. Studies from USA, Brazil, Finland, Sweden, Korea and Italy showed an association between HRQL impairment and MetS.[7-8] HRQL in woman was found to be strongly impacted by MetS.[9] Various components of MetS like hypertension, obesity and insulin resistance were reported to have direct effect on the decreased scores of HRQL in both the sexes.[10]

Many studies regarding MetS have been conducted in India. Our recent study showed that the burden of MetS emerged as a major health problem among young adults, specially from North-Eastern part of India.[11] There is paucity of data on relationship between components of MetS and HQRL in young adults. Hence, it is pertinent to assess the impact of MetS on HRQL in young individuals with MetS. With this background, the present study is designed to compare various domains of health related quality of life in young male and female subjects with and without metabolic syndrome.

## MATERIALS AND METHODS

### Study design

The present study included data from Two hundred and sixteen (216) randomly selected young adults (age 18-25 years) residing in Tripura, a North - Eastern state of India. After application of exclusion criteria, various correlates of metabolic syndrome were evaluated in 167 subjects. Out of 167 subjects 74 were female and 93 were male.

History of any disease and past or present medication was recorded to exclude the subjects having any cardio metabolic disorder from the study. Subjects having diabetes mellitus, hypertension, polycystic ovary and any other cardiovascular disorders were excluded from the study. A questionnaire was formulated for the purpose. The age was recorded as mentioned by the subject. All the participants in this study signed a written consent to participate in the study. Ethical clearance for the study was obtained from Institutional Human Ethical Committee.

### Assessment of Health related quality of life (HRQL)

Health-related quality of life was evaluated using Short Form-36 (SF36) which contains 36 questions covering functional health status and general health.[12] The questionnaire was self-completed by the participants. The 36 questions were summarized into eight subscales measuring-- physical functioning [PF], role physical [RP], bodily pain [BP], general health [GH], vitality [VT], social functioning [SF], role emotional [RE] and

mental health [MH]. For each scale, scores ranged from 0 (the worst) to 100 (the best). Based upon this, two summary scales were constructed.

### Experimental procedure

All anthropometric parameters were recorded following standard procedure.[13] Weight of the subject was measured by using weighing machine with subject standing erect on the machine without shoes and in normal clothing. Height was measured using a stadiometer with subject standing erect without any footwear. Waist circumference was measured by positioning the measuring tap between coastal margin and iliac crest of the subject. Body mass index (BMI) was calculated using the standard expression: BMI = weight (kg)/ height$^2$ (m). Waist to hip ratio (WHR), waist to height ratio (WHtR) were calculated by using formula. Blood pressure of the subject was recorded in supine position by using aneroid sphygmomanometer. Both systolic and diastolic pressures were recorded. Mean and pulse pressure were calculated.

The blood glucose level, serum total cholesterol, HDL cholesterol and triglyceride were estimated by using kits in a biochemical analyzer. Atherogenic indices calculated include HDL-C/TC, HDL-C/LDL-C and TG/ HDL-C ratio.

### Assessment of cardio metabolic risk

The cardio metabolic risk of the subject was assessed by using the harmonized criteria (H_MS) proposed by IDF and other international associations. According to this, presence of any three of the following risk factors in a subject was considered as having MetS:

| | |
|---|---|
| 01. Central Obesity: identified by waist circumference | Population and country specific definitions *<br>*It is recommended that IDF cut points be used for non European and either the IDF or AHA/NHLBI cut points used for the people of European origin until more data are available. |
| 02. Hypertriglyceridema: identified by serum TG level | ≥1.7 mmol/L or drug treatment for elevated TG |
| 03. Serum HDL-C level | <1.0 mmol/L (Male) <1.3 mmol/L (Female) or drug treatment fordecreased HDL-C |
| 04. Elevated Blood Pressure : identified by recording of BP | ≥130/85 mmHg |
| 05. Hyperglycemia : identified by measuring FBS level | 100 mg/dl |

### Statistical analysis

The statistical analyses were performed using the PC version of SPSS statistical software (SPSS 16, IBM, Armonk, New york, USA). Parameters were expressed as Mean ± SD and percentage. Difference between groups were examined by unpaired '*t*' test. Pearson's correlation analysis was performed to establish correlation of physical functioning and general health with MetS components.

## RESULTS

All the baseline characteristics showed significant difference between male and female subjects except blood pressure (both systolic and diastolic) and fasting blood glucose level. Overall female subjects had worst lipid profile in comparison to male subjects (Table 1). Comparison of anthropometric, cardiometabolic parameters between young male and female subjects with and without metabolic syndrome showed that there was significant difference between the metabolic syndrome (MetS) components in both groups with and without metabolic syndrome (Table 2).

The subjects in the MetS group reported lower scores in almost all subscales of quality of life (Table 3). Sex-specific analysis of health related quality of life and psychological characteristics (SF-36 subscales) showed that in both young male and female subjects, there were significant differences in the mean scores of physical functioning ($P < 0.05$) and general health ($P < 0.05$) among groups with and without MetS. In case of women with MetS role emotional (RE) showed a significantly lower values than women without MetS. Other subscales did not show any significant differences between subjects with and without MetS.

Based on these findings, we performed correlation analysis between scores of physical functioning (PF) and general health (GH) subscale with different components of MetS in both male and female subjects (Table 4, 5). PF was found to be correlated significantly with blood pressure (both systolic and diastolic) in young males with MetS whereas young females showed no significant correlation with PF. Similarly, GH significantly correlated with BMI and TG level in male subjects but females showed no significant correlation.

## DISCUSSION

In agreement with studies on MetS in young adults reported from different parts of India and world as a whole,[14-15] our study showed a moderately high prevalence of cardio metabolic risk factors among young adults of Tripura, a North eastern state of India. In urban and semi-urban India, prevalence of metabolic disorders like diabetes and dyslipidaemia is high and continue to increase.[16] A recent study among 1350 IT employees of Pune with mean age 33 ± 6 years revealed a high prevalence of cardio-metabolic risk factors at a relatively young age; 9% of the subjects had prediabetes or diabetes and 33.8% had borderline high BP or hypertension. Only 6.8% employees had no risk factors while 63.5% had clustering of risk factors, the proportions were similar in both male and female.[17] According to reports, in South East Asia, particularly in India, there is an increase in high risk population with respect to

**Table 1: Baseline characteristics of anthropometric, cardio metabolic components in young (18 to 25 yrs age) male and female subjects (Values are in MeanSD; *$p$<0.05, **$p$<0.01, ***$p$<0.001).**

| Parameters | Male subjects (93) | Female subjects (74) | P value |
|---|---|---|---|
| Age | 23.31±1.44 [18 – 25] | 22.26±1.76 [19 – 25] | 0.001*** |
| BMI | 21.65±2.67 [14.16 – 25.93] | 24.03±1.75 [19.86 – 28.47] | 0.001*** |
| WC (cm) | 96.76±11.87 [76.9 – 112.2] | 88.83±4.79 [78.5 – 106] | 0.001*** |
| SBP (mm/Hg) | 124.39±10.55 [104 -140] | 123.96±8.32 [104 – 140] | 0.77 |
| DBP (mm/Hg) | 79.98±7.97 [60 – 94] | 80.96±4.86 [60 – 90] | 0.35 |
| TG (mg/dL) | 138.09±33.18 [75.5 – 195] | 151.84±17.88 [125.5 – 220] | 0.001*** |
| HDL-C (mg/dL) | 39.19±4.90* [23.7 – 50.5] | 48.37±7.00 [30.5 – 60.2] | 0.001*** |
| LDL-C (mg/dL) | 113.53±24.10* [44.4 – 146.5] | 137.24±18.46 [96 – 168.4] | 0.001*** |
| FBS (mg/dL) | 96.26±14.58 [70.5 – 150.8] | 94.32±15.36 [70.4 – 122.8] | 0.40 |

**Table 2: Comparison of cardio metabolic parameters in young subjects with and without metabolic syndrome (Values are in MeanSD; *$p$<0.05).**

| Parameters | Male subjects (93) | | Female subjects (74) | |
|---|---|---|---|---|
| MetS status | With MetS (21) | Without MetS (72) | With MetS (17) | Without MetS (57) |
| Age | 23.38±1.53 | 23.29±1.42 | 22.71±1.77 | 22.12±1.74 |
| Body mass index -BMI | 23±2.03 | 21.26±2.71* | 24.76±1.83 | 23.82±1.67 |
| Waist circumference-WC | 107.78±4.81 | 93.54±11.37* | 91.36±1.58 | 88.08±5.15* |
| Systolic BP (mmHg) | 134.76±3.77 | 121.38±9,96* | 124.35±9.96 | 118.70±9.81* |
| Diastolic BP (mmHg) | 85.62±4.69 | 78.33±7.98* | 81.59±4.54 | 77.54±6.45* |
| Fasting Blood Sugar FBS (mg/dl) | 96.19±15.23 | 96.28±14.38 | 110.34±12.39 | 89.54±12.70* |
| Triglyceride -TG (mg/dl) | 164.24±6.44 | 130.47±33.95* | 170.48±19.43 | 146.29±12.96* |
| Total Cholesterol -TC (mg/dl) | 199.68±8.97 | 175.04±31.36* | 212.58±24.29 | 216.58±17.79 |
| High Density Lipoprotein -HLDL-C (mg/dl) | 36.95±3.14 | 39.84±5.07* | 40.97±5.29 | 50.57±5.84* |
| Low Density Lipoprotein -LDL-C (mg/dl) | 129.87±8.95 | 108.76±25.02* | 137.22±24.44 | 137.24±16.26 |

**Table 3: Health-related quality of life and psychological characteristics of young participants with and without MetS.**

| SF 36 Subscales | Male | | Female | |
|---|---|---|---|---|
| | With MetS | Without MetS | With MetS | Without MetS |
| PF | 62.86 ±17.36 | 72.99± 16.02* | 60.29 ±12.30 | 70.78 ±15.03* |
| RP | 51.19 ±29.35 | 54.86± 28.76 | 44.12 ±29.12 | 49.67 ±32.96 |
| BP | 77.26 ±19.30 | 75.07 ±20.89 | 72.35 ±24.67 | 70.31 ±26.03 |
| GH | 43.81 ±18.19 | 52.08± 11.69* | 41.69 ±15.79 | 51.14 ±12.98* |
| VT | 56.19 ±15.80 | 57.70± 13.03 | 53.53 ±13.80 | 55.29 ±12.31 |
| SF | 69.05 ±20.99 | 72.92 ±20.73 | 69.85 ±26.45 | 73.68 ±24.97 |
| RE | 60.31 ±37.97 | 62.03 ±33.94 | 39.21 ±30.76 | 61.98 ±37.70* |
| MH | 66.16 ±14.31 | 64.54 ±13.72 | 56.53 ±14.67 | 59.79 ±14.87 |

Abbreviations: PF, Physical Functioning; RP, Role Physical; BP, Bodily Pain; GH, General Health; VT, Vitality; SF, Social Functioning; RE, Role Emotional; MH, Mental Health; --*$p$<0.05 for the comparison between groups,

Values are expressed as mean (standard deviation) for continuous variables.

**Table 4 : Correlation between PF with BMI and MetS components in male and female subjects.**

| Variables | Physical Functioning (PF) | | | |
|---|---|---|---|---|
| | Male | | Female | |
| | r | P | r | P |
| Body Composition BMI (kg/m$^2$) | -0.074 | 0.240 | 0.044 | 0.355 |
| MetS components | | | | |
| WC (cm) | -0.154 | 0.070 | -0.139 | 0.119 |
| SBP/DBP (mmHg) | -0.243/-0.179 | 0.009/0.043* | -0.012/-0.121 | 0.459/0.152 |
| TG (mg/dl) | -0.085 | 0.209 | -0.111 | 0.173 |
| HDL-C (mg/dl) | -0.026 | 0.402 | 0.064 | 0.294 |
| FBS (mg/dl) | -0.115 | 0.136 | -0.040 | 0.368 |

**Table 5 : Correlation between GH with BMI and MetS components in male and female subjects.**

| Variables | General Health (GH) | | | |
|---|---|---|---|---|
| | Male | | Female | |
| | r | P | r | P |
| Body Composition BMI (kg/m$^2$) | -0.180 | 0.042* | 0.072 | 0.271 |
| MetS components | | | | |
| WC (cm) | -0.139 | 0.092 | -0.098 | 0.203 |
| SBP/DBP (mmHg) | -0.113/0.058 | 0.140/0.290 | -0.061/0.016 | 0.303/0.446 |
| TG (mg/dl) | -0.171 | 0.051* | -0.081 | 0.246 |
| HDL-C (mg/dl) | -0.048 | 0.324 | 0.007 | 0.476 |
| FBS (mg/dl) | -0.109 | 0.149 | -0.169 | 0.75 |

BMI-Body mass index, WC- Waist circumference, SBP- Systolic blood pressure, DBP-Diastolic blood pressure, FBS-Fasting blood sugar, TG-Triglyceride, HDL-C– High density lipoprotein- Cholesterol,

** Correlation is significant at the 0.05 level

diabetes and CVD during previous decade and the numbers are consistently increasing.[18] As expected, young subjects with MetS exhibited higher BMI, waist circumference as well as BP measurements in comparison to the subjects without MetS. Furthermore, fasting blood glucose, serum triglyceride, LDL cholesterol and HDL cholesterol showed significant variation between MetS and non-MetS groups.

Using different MetS criteria like IDF criteria and NCEP ATP III criteria gives different estimates for MetS. A study among European population showed use of IDF criteria provide higher prevalence of MetS than the estimate based NCEP ATP III criteria.[19] Different questionnaire form used to evaluate the quality of life, criteria to estimate MetS and sample size may cause variations in results in different studies.[20] We assessed MetS in our study by using hermonized criteria (H_MS). HRQL evaluated by using SF 36 questionnaire among the young adults in our study. Comparisons of HRQL between young male and female subjects with and without MetS showed no significant difference in any of the subscales except physical functioning, general health and role limitation due to emotional problem: these showed significantly lower values in

subjects with MetS. The short form 36 item (SF-36) questionnaire used in our study is a generic instrument that evaluate quality of life associated with different conditions.[21] These questions are useful to assess the quality of life in different groups of people in different clinical conditions.[22] However, using such questions allows to investigate the quality of life in both adolescents and adults as it makes possible the evaluation of changes in quality of life across the life span and for longitudinal follow up.[23]

A predominance of anxiety and depressive symptoms also was observed among subjects with MetS along with physical components.[24] Studies involving women without, with transient and with persistent MetS showed, those with intermittent MetS reported poorer physical health-related quality of life compared to other two groups.[25] It is reported that both age and gender are having impact on HRQL analysis. Therefore, it is important to take both these factors into consideration when planning studies and when comparing results from different groups, studies or over time.[26] In line with findings from the majority of research about HRQL, the males in our study, reported higher scores than the females. A significant difference was observed in PF and GH domains of HRQL among both male and female subjects with and without MetS. All other HRQL domains showed non-significant differences between subjects with and without MetS.

The relationship between physical functioning (PF), general health (GH) and components of metabolic syndrome in young male and female subjects showed that only in males systolic and diastolic blood pressure correlated significantly with PF and BMI, TG level significantly correlates with GH. Having hypertension and being aware of it were reported to be related to lower health-related quality of life. Antihypertensive medication was associated with more physically unhealthy days, while there were no differences in health-related quality of life by control status. Ayalon *et al*. from their study showed that worse financial status, poorer blood pressure control, higher body mass index, mental distress and following a hypertension diet were associated with better HRQL.[27] The impact of overweight and obesity on health-related quality-of-life (HRQL) in the general population in western Sweden was investigated by Larsson *et al*. their results showed that obese men aged 16-34 yrs had lower HRQL in comparison to normal-weight men on all four physical health scales of the SF-36 and on two of the four mental health scales.[28] Obese women in the same age group rated their health worse than normal-weight women on three of the physical health scales. Thus, in younger men and women the analysis indicated a clearer negative association between obesity and physical health than between obesity and mental health. Obese women aged 35-64 years rated their health worse on all scales than normal-weight women did, while obese men in this age group rated their health worse on only two SF-36 subscales-physical functioning and general health perception. The massively obese men and women suffered from a poor level of HRQL. Jia *et al*. found persons with obesity had significantly lower HRQL than those who were normal weight and such lower scores were seen even for persons without chronic diseases known to be linked to obesity.[29] A study in Taiwan by Huang *et al*. showed excess weight was related to worse physical, but not mental HRQL. The lack of impact of increased body weight on mental health status presented a potential challenge to preventing the increases in obesity.[30] However, our study showed a poor correlation between the markers of obesity and HRQL in both male and female subjects.

### Limitation

The SF-36 questionnaire used in the study is a generic one and not an specific questionnaire for MetS**.** The cross sectional nature of the data limited the conclusion regarding causal relationship between MetS and HRQL from the study.

## CONCLUSION

Presence of cardio-metabolic risk factors at young age have a minimum influence on quality of life during the period.

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## CONFLICT OF INTEREST

I, the undersigned corresponding author, certify that we have no commercial associations that might pose a conflict of interest in connection with the submitted article.

## ABBREVIATIONS

**BMI:** Body Mass Index; **MetS:** Metabolic Syndrome; **HRQL:** Health Related Quality of Life; **IDF:** International Diabetes Federation; **H_MS:** Hermonized definition of Metabolic Syndrome; **TG:** Triglyceride; **HDL-C:** High Density Lipoprotein Cholesterol; **LDL-C:** Low Density Lipoprotein- Cholesterol; **TC:** Total Cholesterol; **FBS:** Fasting Blood Sugar; **BP:** Blood Pressure; **WC:** Waist Circumference; **WHR:** Waist – Hip ratio; **WHtR:** Waist- Height ratio.

## SUMMARY

We investigated the relationship between components of Metabolic Syndrome ( MetS) and parameters of Health Related Quality of Life (HRQL) in young adults with an aim to explore the possible impact of cardio – metabolic risk factors on quality of life during the early stage of an individual's life. We observed lesser values for most of the subscales of quality of life parameters in subjects with metabolic syndrome. However, most of the differences between the groups were non significant. A sex specific difference in scores of various subscales were also observed. Most of the quality of life parameters showed non significant negative correlation with components of metabolic syndrome. Findings of the study implies that components of metabolic syndrome have minimum impact on quality of life during the early stage of an individual's life.

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