

## Metabolic syndrome and quality of life: a systematic review<sup>1</sup>

Patrícia Pozas Saboya<sup>2</sup>  
Luiz Carlos Bodanese<sup>3</sup>  
Paulo Roberto Zimmermann<sup>3</sup>  
Andréia da Silva Gustavo<sup>4</sup>  
Caroline Melo Assumpção<sup>5</sup>  
Fernanda Londero<sup>5</sup>

**Objectives:** to present currently available evidence to verify the association between metabolic syndrome and quality of life. **Method:** Cochrane Library, EMBASE, Medline and LILACS databases were studied for all studies investigating the association with metabolic syndrome and quality of life. Two blinded reviewers extracted data and one more was chosen in case of doubt. **Results:** a total of 30 studies were included, considering inclusion and exclusion criteria, which involved 62.063 patients. Almost all studies suggested that metabolic syndrome is significantly associated with impaired quality of life. Some, however, found association only in women, or only if associated with depression or Body Mass Index. Merely one study did not find association after adjusted for confounding factors. **Conclusion:** although there are a few studies available about the relationship between metabolic syndrome and quality of life, a growing body of evidence has shown significant association between metabolic syndrome and the worsening of quality of life. However, it is necessary to carry out further longitudinal studies to confirm this association and verify whether this relationship is linear, or only an association factor.

**Descriptors:** Metabolic Syndrome X; Quality of Life; Risk Factors; Secondary Prevention; Cardiovascular Diseases; Metabolism.

<sup>1</sup> Paper extracted from Doctoral Dissertation "Efeitos da modificação do estilo de vida nos parâmetros metabólicos e na qualidade de vida de pacientes com síndrome metabólica", presented to Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil.




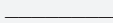
<sup>2</sup> PhD.

<sup>3</sup> PhD, Full Professor, Faculdade de Medicina, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil.

<sup>4</sup> PhD, Professor Adjunto, Faculdade de Enfermagem, Nutrição e Fisioterapia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil.

<sup>5</sup> RN.

### How to cite this article

Saboya PP, Bodanese LC, Zimmermann PR, Gustavo AS, Assumpção CM, Londero F. Metabolic syndrome and quality of life: a systematic review. Rev. Latino-Am. Enfermagem. 2016;24:e2848. [Access   ]; Available in: . DOI: <http://dx.doi.org/10.1590/1518-8345.1573.2848>. month day year

URL

## Introduction

Metabolic Syndrome (MS), understood as a complex set of cardiovascular risk factors, related to abdominal fat accumulation and resistance to insulin, is strongly associated with high cardiovascular morbimortality<sup>(1-4)</sup>, even when type 2 diabetes is not present<sup>(4)</sup>. The analysis of the Heart Outcomes Protection Evaluation – HOPE study corroborated this idea and adds that the increase in the risk is directly and progressively associated with the increase in waist circumference (WC)<sup>(5)</sup>.

Several definitions of MS have come up along these years, although they show some variations concerning criteria and reference values for the metabolic parameters connected with the syndrome. According to The Third Report of The National Cholesterol Education Program (NCEP-ATP III), definition recommended by I Brazilian guidelines on diagnosis and treatment of MS, the presence of alterations in 3 out of 5 risk factors, such as abdominal obesity (AO); WC >102cm for men and >88cm for women, triglycerides  $\geq$ 150mg/dl; HDL cholesterol <40mg/dl for men and <50mg/dl for women, Blood Pressure  $\geq$ 130/85 mmHg and fasting glucose  $\geq$ 110mg/dl, would form the MS diagnosis, regardless of the presence of glycemia<sup>(1-2)</sup>.

Nevertheless, considering the available evidence on the connection between central obesity and risk for cardiovascular disease, the International Diabetes Federation (IDF) published in 2005 a new MS criterion, requiring the presence of AO as well as 2 or more criteria for the MS diagnosis, also proposing reduction in the WC reference values  $\geq$ 94cm for men and  $\geq$ 80cm for women, and glucose levels  $\geq$ 100 mg/dl<sup>(3)</sup>.

The incidence level of MS has been increasing progressively in the last decades, estimating a prevalence of up to 23.7%, according to ATP III criteria

when adjusted for age, according to a study carried out in the USA with a sample of 8.814 adults<sup>(6)</sup>.

Despite all progress made in understanding and treating MS, it is still an important public health issue. Moreover, the study of the impact of MS on the quality of life (QOL) has been receiving little attention in medical literature and because of that, is still controversial and is not well understood. Our aim was to present currently available evidence for all studies investigating the effects of the MS on the QOL to verify the association between MS and the QOL.

## Method

The databases searched were the Cochrane Library, EMBASE, Medline and LILACS through 1988 to present, using the following key words: Metabolic Syndrome X, Risk Factors and Quality of Life, for all studies investigating the effects of the MS on the QOL. References from the above studies not identified in the database search were also surveyed.

The study selection considered: adults of both sexes and all studies published in English, Spanish and Portuguese language. Those who had a small sample size or presented another important associated disease were excluded to avoid possible biases. Studies not meeting these criteria were excluded.

The data were extracted by two blinded reviewers and were subjected to qualitative analysis. Disagreements were resolved by consensus, but one more reviewer was chosen in case of doubt. Reviewers extracted information on authors, publication year, sample size, study design, including the duration of follow-up, and results.

The search strategy adopted in the Medline, which was also used for the other databases analyzed, is presented in the Figure 1.

#1 Metabolic syndrome x (MESH Terms)
#2 Quality of life (MESH Terms)
#3 Risk factors (MESH Terms)
#1 AND #2 AND #3
Limits Activated: From 1988/01/01 to 2016/08/15, Humans, English, Portuguese, Spanish
Adult: 19+ years, Adult:19-44 years, Aged:65+ years

Figure 1 - Search strategy in the Medline/ Pubmed databases

## Results

Although there are few studies in this area, most of them show association between MS and worsening in QOL<sup>(7-16)</sup>, even more significant when regarding subjects who also have depression<sup>(17)</sup>.

However, a cross-sectional study assessing 390 obese patients, out of which 269 filled MS criteria, showed that MS in itself was not associated with a reduction in QOL, but only showed significant correlation when associated with other factors, such as depression<sup>(18)</sup>.

A recent study involving 4.480 subjects revealed that the number of components diagnosed with MS was inversely associated with General Health, in both genders, although it was positively associated with Mental Health<sup>(7)</sup>. Another two studies<sup>(19-20)</sup> corroborated the idea of the impact of the MS components on the worsening of QOL, more specifically in the domains of Physical Health, although the studies demonstrated that this association is only significant in women.

Similarly, cross-sectional studies reveal that this association between MS and QOL differs according to the gender<sup>(19-24)</sup>.

According to the results of a cross-sectional study with 4.463 subjects of both genders, the decrease in QOL scores is directly proportional to the increase in the number of MS components in men as well as women, although this association is significant only in women<sup>(21)</sup>.

Likewise, two other cross-sectional studies with 950 and 2.264 subjects of both genders, respectively, also showed that this association between MS and decrease in the QOL scores was only significant in women<sup>(20,22)</sup>.

Results of a Swedish study with 1.007 men and women with MS, although showing lower scores in the physical and social domains of the Medical Outcomes Study Short Form, General Health Survey (SF-36) in subjects of both genders, showed that, after adjustments for confounding factors, such as age, smoking, physical activity, etc., this difference was also significant in women. This study also revealed that there were no differences for mental health or perceived stress between subjects with and without MS<sup>(23)</sup>.

Similarly, even though another instrument for measuring QOL was used, a cross-sectional study with 9.570 men and women from Iran also showed association between QOL domains (social relation and physical health) and MS only in women, after adjusted for confounding factors<sup>(24)</sup>.

In addition, cross-sectional studies carried out with women<sup>(25)</sup>, with significant samples of 6.913<sup>(26)</sup> and 6.805<sup>(27)</sup> subjects respectively showed significant association between MS and worsening of QOL. Although some studies show this association, it only takes place in the Physical Health domain of QOL<sup>(26-27)</sup>.

Recent studies of intervention in order to change MS patients' lifestyles already show results of significant improvement in QOL<sup>(28-33)</sup>.

A randomized controlled trial with 201 obese women with 1 or more MS components, followed by 12-month, demonstrated that, after the intervention,

the prevalence of MS decreased and the QOL scores increased in most domains in the group of intensive intervention, compared to the group of moderate intervention<sup>(29)</sup>.

According to data from another randomized controlled trial with 390 obese patients of both genders that showed at least two MS criteria, after the 6th month of intervention there was significant improvement in several QOL domains of the SF-36, and this association was more significant in women in the 24-month follow-up<sup>(28)</sup>.

Similarly, an intervention study conducted in Brazil with a 9-month follow-up also showed significant improvement in QOL scores in most SF-36 domains, especially in the group of intensive intervention<sup>(30)</sup>.

Another two randomized controlled trials followed by 1 year, also demonstrated significant improvement in QOL, specially in Mental Health domains<sup>(31-32)</sup>.

However, a 12-week Hatha yoga intervention on MS showed not only beneficial changes in Mental Health (social functioning), but also in Physical Health (general health and Physical component score)<sup>(33)</sup>.

A cohort of 1.785 subjects, showed that low QOL scores, in the physical health domain of the SF-36, were associated with MS and significantly predicted 5-year mortality<sup>(34)</sup>.

Similarly, another cohort study with 657 subjects, during 7 years, also showed that MS, anxiety and depressive symptoms are independent predictors of poorer subjective health and QOL. MS was associated with weaker self-rated health in men, but weaker perceived life satisfaction in women<sup>(35)</sup>.

However, a cross-sectional analysis of a study with 361 subjects in two weight-loss programs revealed that, although an association between MS and low scores of QOL were found only in the physical health domain of the SF-36, this association was not kept after being adjusted for BMI, which means that this QOL worsening will be explained by the BMI increase and not by the MS itself<sup>(36)</sup>.

Nevertheless, only one cross-sectional study did not find significant association between MS and QOL after adjustments such as age, gender, smoking and so forth<sup>(37)</sup>.

A total of 133 studies were screened, however only 61 were assessed for eligibility and only 30 were included in this review, which included 62.063 patients (Figure 2).

The Figures 3 and 4 show observational and clinical trials studies, respectively reporting the association between MS and quality of life.

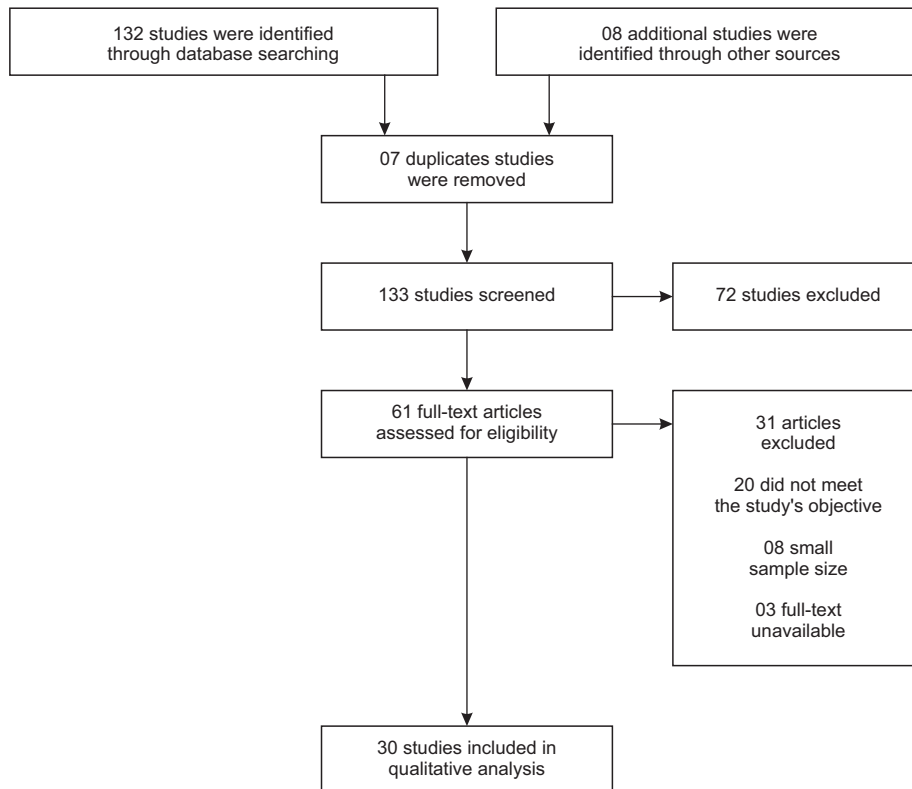


Figure 2 - Flow chart of selection studies

Author, year	N	Design	Outcome
Lidfelt et al., 2003	6.805 f*	cs†	Low physical QOL‡ associated with MS§ components
Roriz-Cruz et al., 2007	422	cs†	MS§ associated with low HRQOL
Mietolla et al., 2008	480	cs†	MS§ associated with impaired of QOL‡
Qader et al., 2008	6.913 f*	cs†	MS§ associated with impaired of QOL‡
Corica et al., 2008	1.822	cs†	MS§ correlated just with physical domain of SF-36¶
Tsai et al., 2008	361	cs†	MS§ associated with lower HRQOL   scores, but eliminated after adjusted
Ford, Li, 2008	1.859	cs†	MS§ associated with worse HRQOL
Han et al., 2009	456	cs†	MS§ associated with impaired of QOL‡
Frisman et al., 2009	1.007	cs†	MS§ associated with lower scores of SF-36¶, only in women after adjusted
Zhang et al., 2010	1.785	Cohort	Lower SF-36¶ scores associated with MS§
Hjellset et al., 2010	198 f*	cs†	Women with MS§ have lower GH**, PF†† and more BP‡‡, than those without MS§
Amiri et al., 2010	950	cs†	MS§ associated with poor HRQOL   in women
Huang et al., 2011	140	cs†	MS§ associated with impaired of QOL‡ if associated with depression or diabetes
Sarrafzadegan et al., 2011	9.570	cs†	MS§ associated with QOL‡ only in women, after adjusted
Vetter et al., 2011	390	cs†	MS§ associated with impaired of QOL‡ if associated with depression
Park et al., 2011	4.463	cs†	MS§ associated with impaired of QOL‡ just in women
Sohn et al., 2011	2.264	cs†	MS§ associated with impaired of QOL‡ just in women
Roohafza et al., 2012	468	cs†	MS§ associated with impaired of QOL‡
Lee et al., 2012	8.941	cs†	No association between MS§ and HRQOL   after adjusted
Pinar et al., 2012	310	cs†	MS§ associated with low HRQOL
Katano et al., 2012	4.480	cs†	MS§ components was inversely associated with GH** and positively with mental health
Okosun et al., 2013	5.170	cs†	MS§ associated with poor overall, physical and mental health
Rouch et al., 2014	657	Cohort	MS§ was independent predictor of poorer subjective health and QOL‡
Amiri et al., 2015	950	cs†	MS associated with poor physical domain in women

\* f = Female, † cs = Cross-sectional, ‡ QOL = Quality of life, § MS = Metabolic syndrome, || HRQOL = Health-Related Quality of Life, ¶ SF-36 = Medical Outcome Study Short Form, General Health Survey (SF-36), \*\* GH = General Health, †† PF = Physical Functioning, ‡‡ BP = Bodily Pain

Figure 3 - Observational studies reporting the relation between metabolic syndrome and quality of life

Author, year	N	Design	Outcome
Kalter Lebovici et al., 2010	201 f □	rct <sup>†</sup>	Better QOL <sup>‡</sup> scores in the intensive group
Cezareto, 2010	177	rct <sup>†</sup>	Better QOL <sup>‡</sup> scores in almost domains of SF-36 <sup>§</sup> in the intensive intervention
Sarwer et al., 2013	390	rct <sup>†</sup>	Greater weight loss was associated with greater HRQOL <sup>¶</sup> , more significant in women
Kanaya et al., 2014	135	rct <sup>†</sup>	Stretching group had improved QOL <sup>‡</sup> in MH <sup>¶</sup> at 6 and 12 months
Stuckey et al., 2015	126	rct <sup>†</sup>	Better HRQOL <sup>¶</sup> scores in the physical functioning, general health, vitality and MH <sup>¶</sup> in the entire study population,
Lau et al., 2015	173	rct <sup>†</sup>	Hatha yoga program produced beneficial changes in HRQOL <sup>¶</sup> : general health, Physical component score and social functioning.

\* f = Female, <sup>†</sup> rct = Randomized controlled trial, <sup>‡</sup> QOL = Quality of life, <sup>§</sup> SF-36 = Medical Outcome Study Short Form, General Health Survey (SF-36), <sup>¶</sup> HRQOL = Health-Related Quality of Life, <sup>¶</sup> MH = Mental health

Figure 4 - Clinical trials reporting the relation between metabolic syndrome and quality of life

Among the instruments used for measuring health-related quality of life (HRQOL), the SF-36 was the most frequently used comprising a total of 16 out of the 30 selected studies, though 3 of them have been used in its reduced version.

Almost all studies suggested that MS is significantly associated with QOL. Some, however, found association only in women, or only if associated with depression or BMI. Merely one study did not find association after adjusted for confounding factors. Graphical representations of results are shown in Figure 5.

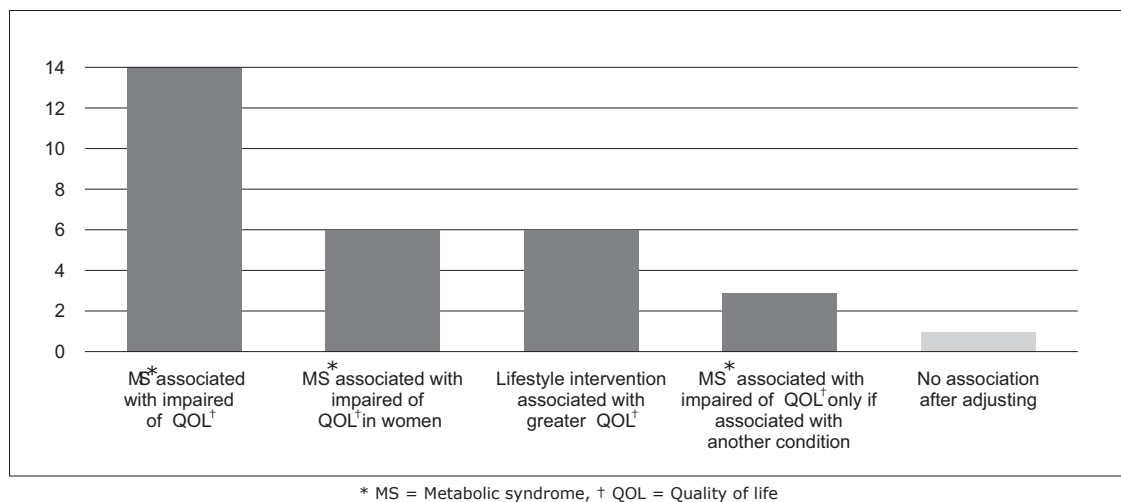


Figure 5 - All studies reporting Metabolic syndrome and quality of life

## Discussion

Our systematic review was designed to provide an overview of what is known about the association between MS and QOL.

Unfortunately, there is still little evidence as well as some problems concerning a high proportion of cross-sectional studies and different HRQOL instruments have contributed to the lack of evidence.

In addition, it was observed in this review, different study populations. Once these studies come from different countries with several cultures and lifestyles, it is difficult to generalize the data found.

Nevertheless, a growing body of evidence demonstrates significant association between MS and

worsening in the QOL, more specifically in women. It is necessary to carry out further longitudinal research to determine if this relationship is linear, or only an association factor.

Another important factor that needs to be investigated refers to a more precise identification of the QOL domains that are more affected by the presence of MS. Few studies refer to these data, once different instruments are used to measure this variable.

On the other hand, recent intervention studies already show improvement in the metabolic parameters and quality of life based on programs for changing lifestyles, which may contribute to a future intervention strategy. However, there is still doubt whether these findings remain after the intervention.

All things considered, we note that the study of the relationship between MS and QOL, due to its relevance been receiving little attention in medical literature.

The present review has some limitations: the design of the studies, i.e., a high proportion of cross-sectional studies and the different HRQOL instruments used.

## Conclusion

Although there are a few studies available about the relationship between MS and QOL, a growing body of evidence has shown significant association between metabolic syndrome and the worsening of quality of life. Similarly, lifestyle interventions in individuals with MS demonstrated improvement of MS and better QOL scores.

However, it is necessary to carry out further longitudinal studies to confirm this association and verify whether this relationship is linear, or only an association factor.

The contribution of the present study was to draw attention to the effects that the MS can have on QOL, in an attempt to improve prevention and treatment strategies for MS, considering the fact that MS is still an important public health issue.

## Acknowledgments

To thank Isabel Merlo Crespo for her important contribution in the data search.

## References

1. I Brazilian guidelines on diagnosis and treatment of metabolic syndrome. *Arq Bras Cardiol.* [Internet]. 2005 [Access Apr 18, 2015];84 Suppl 1:1-28. Available in: <http://www.ncbi.nlm.nih.gov/pubmed/16095065>.
2. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, And Treatment of High Blood Cholesterol In Adults (Adult Treatment Panel III). *JAMA.* [Internet]. 2001 [Access Apr 18, 2015];285:2486-97. Available in: <http://www.ncbi.nlm.nih.gov/pubmed/11368702>.
3. Alberti G, Zimmet P, Shaw J, Grundy SM. The IDF consensus worldwide definition of the metabolic syndrome [Internet]. Brussels: International Diabetes Federation; 2006. Access Apr 18, 2015. ;Available in: [www.idf.org/webdata/docs/IDF\\_Meta\\_def\\_final.pdf](http://www.idf.org/webdata/docs/IDF_Meta_def_final.pdf).
4. Mottillo S, Filion KB, Genest J, Joseph L, Pilote L, Poirier P, et al. The metabolic syndrome and cardiovascular risk a systematic review and meta-analysis. *J Am Coll Cardiol.* 2010 Sep 28;56(14):1113-32. doi: 10.1016/j.jacc.2010.05.034.
5. Dagenais GR, Yi Q, Mann JF, Bosch J, Pogue J, Yusuf S. Prognostic impact of body weight and abdominal obesity in women and men with cardiovascular disease. *Am Heart J.* 2005 Jan;149(1):54-60. doi: 10.1016/j.ahj.2004.07.009.
6. Ford ES, Giles WH, Dietz WH. Prevalence of the metabolic syndrome among US adults: findings from the third National Health and Nutrition Examination Survey. *JAMA.* [Internet]. 2002 Jan 16 [Access Apr 18, 2015];287(3):356-9. Available in: <http://www.ncbi.nlm.nih.gov/pubmed/11790215>.
7. R ikk nen K, Matthews K.A, Kuller LH. Depressive symptoms and stressful life events predict metabolic syndrome among middle-aged women: a comparison of World Health Organization, Adult Treatment Panel III, and International Diabetes Foundation definitions. *Diabetes Care.* 2007 Apr;30(4):872-7. Errata in: *Diabetes Care.* 2007 Oct;30(10):2761. doi: 10.2337/dc06-1857.
8. Katano S, Nakamura Y, Nakamura A, Suzukamo Y, Murakami Y, Tanaka T, et al. Relationship between health-related quality of life and clustering of metabolic syndrome diagnostic components. *Qual Life Res.* 2012 Sep;21(7):1165-70. doi: 10.1007/s11136-011-0029-y. Epub 2011 Oct 8.
9. Ford ES, Li C. Metabolic syndrome and health-related quality of life among U.S. adults. *Ann Epidemiol.* 2008 Mar;18(3):165-71. doi: 10.1016/j.annepidem.2007.10.009.
10. Miettola J, Niskanen LK, Viinam ki H, Sintonen H, Kumpusalo E. Metabolic syndrome is associated with impaired health-related quality of life: Lapinlahti 2005 study. *Qual Life Res.* 2008 Oct;17(8):1055-62. doi: 10.1007/s11136-008-9386-6. Epub 2008 Aug 31.
11. Roohafza H, Sadeghi M, Talaei M, Pourmoghaddas Z, Sarrafzadegan N. Psychological status and quality of life in relation to the metabolic syndrome: Isfahan cohort study. *Int J Endocrinol.* 2012;2012:380902. doi: 10.1155/2012/380902. Epub 2012 May 20.
12. Han JH, Park HS, Shin CI, Chang HM, Yun KE, Cho SH, et al. Metabolic syndrome and quality of life (QOL) using generalised and obesity-specific QOL scales. *Int J Clin Pract.* 2009 May;63(5):735-41. doi: 10.1111/j.1742-1241.2009.02021.x.
13. Corica F, Corsonello A, Apolone G, Mannucci E, Lucchetti M, Bonfiglio C, et al. Metabolic Syndrome, psychological status and quality of life in obesity: the QUOVADIS Study. *Int J Obes. (Lond).* 2008 Jan;32(1):185-91. doi: 10.1038/sj.ijo.0803687. Epub 2007 Jul 24.
14. Roriz-Cruz M, Rosset I, Wada T, Sakagami T, Ishine M, Roriz-Filho JS, et al. Stroke-independent

- association between metabolic syndrome and functional dependence, depression, and low quality of life in elderly community-dwelling Brazilian people. *J Am Geriatr Soc.* 2007 Mar;55(3):374-82. doi: 10.1111/j.1532-5415.2007.01068.x.
15. Pinar T, Pinar G, Dogan N. The presence of metabolic syndrome and associated quality of life in Turkish women with cardiovascular disease. *Acta Medica.* [Internet]. 2012 [Access Apr 28, 2015];1:1-10. Available in: [www.tip.hacettepe.edu.tr/actamedica/2012/sayi\\_1/baslik1.pdf](http://www.tip.hacettepe.edu.tr/actamedica/2012/sayi_1/baslik1.pdf).
16. Okosun IS, Annor F, Esuneh F, Okoegwale EE. Metabolic syndrome and impaired health-related quality of life and in non-Hispanic White, Non-Hispanic Blacks and Mexican-American Adults. *Diabetes Metab Syndr.* 2013 Jul-Sep;7(3):154-60. doi: 10.1016/j.dsx.2013.06.007. Epub 2013 Jul 31.
17. Huang CY, Chi SC, Sousa VD, Wang CP, Pan KC. Depression, coronary artery disease, type 2 diabetes, metabolic syndrome and quality of life in Taiwanese adults from a cardiovascular department of a major hospital in Southern Taiwan. *J Clin Nurs.* 2011 May;20(9-10):1293-302. doi: 10.1111/j.1365-2702.2010.03451.x. Epub 2010 Sep 8.
18. Vetter ML, Wadden TA, Lavenberg J, Moore RH, Volger S, Perez JL, et al. Relation of health-related quality of life to metabolic syndrome, obesity, depression and comorbid illnesses. *Int J Obes. (Lond).* 2011 Aug;35(8):1087-94. doi: 10.1038/ijo.2010.230. Epub 2010 Nov 2. Erratum in: *Int J Obes (Lond).* 2012 Feb;36(2):325-6.
19. Amiri P, Hosseinpanah F, Rambod M, Montazeri A, Azizi F. Metabolic syndrome predicts poor health-related quality of life in women but not in men: Tehran Lipid and Glucose Study. *J Womens Health. (Larchmt).* 2010 Jun;19(6):1201-7. doi: 10.1089/jwh.2009.1710.
20. Amiri P, Deihim T, Taherian R, Karimi M, Gharibzadeh S, Asghari-Jafarabadi M, et al. Factors Affecting Gender Differences in the Association between Health-Related Quality of Life and Metabolic Syndrome Components: Tehran Lipid and Glucose Study. *PLoS One.* 2015 Dec 1;10(12):e0143167. doi: 10.1371/journal.pone.0143167.
21. Park SS, Yoon YS, Oh SW. Health-related quality of life in metabolic syndrome: the Korea National Health and Nutrition Examination Survey 2005. *Diabetes Res Clin Pract.* 2011 Mar;91(3):381-8. doi: 10.1016/j.diabres.2010.11.010. Epub 2010 Dec 4.
22. Sohn YJ, Sohn HS, Kwon JW. Gender differences among middle-aged Koreans for Health-related quality of life related to metabolic syndrome. *Qual Life Res.* 2011 May;20(4):583-92. doi: 10.1007/s11136-010-9789-z. Epub: 2010 Nov 10.
23. Frisman GH, Kristenson M. Psychosocial status and health related quality of life in relation to the metabolic syndrome in a Swedish middle-aged population. *Eur J Cardiovasc Nurs.* 2009 Sep;8(3):207-15. doi: 10.1016/j.ejcnurse.2009.01.004. Epub 2009 Feb 26.
24. Sarrafzadegan N, Gharipour M, Ramezani MA, Rabiei K, Zolfaghar B, Tavassoli AA, et al. Metabolic syndrome and health-related quality of life in Iranian population. *J Res Med Sci.* [Internet]. 2011 [Access May 15, 2015];16(3):254-61. PMC3214330. Available from: <<http://www.jrms.mui.ac.ir/index.php/jrms/article/view/6828>>
25. Hjellset VT, Ihlebæk CM, Bjorge B, Eriksen HR, Hostmark AT. Health-Related Quality of Life, Subjective Health Complaints, Psychological Distress and Coping in Pakistani Immigrant Women With and Without the Metabolic Syndrome: The InnvaDiab-DEPLAN Study on Pakistani Immigrant Women Living in Oslo, Norway. *J Immigr Minor Health.* 2011 Aug;13(4):732-41. doi: 10.1007/s10903-010-9409-6
26. Qader SS, Shakir YA, Samsioe G. Could quality of life impact the prevalence of metabolic syndrome? Results from a population-based study of Swedish women: the Women's Health in the Lund Area Study. *Metab Syndr Relat Disord.* 2008 Sep;6(3):203-7. doi: 10.1089/met.2008.0014.
27. Lidfeldt J, Nyberg P, Nerbrand C, Samsioe G, Scherstén B, Agardh CD. Socio-demographic and psychosocial factors are associated with features of the metabolic syndrome. The Women's Health in the Lund Area (WHILA) study. *Diabetes Obes Metab.* 2003 Mar;5(2):106-12. PMID: 12630935. doi: 10.1046/j.1463-1326.2003.00250.x
28. Sarwer DB, Moore RH, Diewald LK, Chittams J, Berkowitz RI, Vetter M, et al; POWER-UP Research Group. The Impact of a Primary Care-Based Weight Loss Intervention on Quality of Life. *Int J Obes. (Lond).* 2013 Aug;37 Suppl 1:S25-30. doi: 10.1038/ijo.2013.93.
29. Kalter-Lebovici O, Younis-Zeidan N, Atamna A, Lubin F, Alpert G, Chetrit A, et al. Lifestyle intervention in obese Arab women: a randomized controlled Trial. *Arch Intern Med.* 2010;170(11):970-6. doi: 10.1001/archinternmed.2010.103.
30. Cezaretto A. Intervenção interdisciplinar para prevenção de Diabetes Mellitus sob a perspectiva da psicologia: benefícios na qualidade de vida. [Dissertação de mestrado]. São Paulo: Universidade de São Paulo; 2010. ID: lil-575213.
31. Kanaya AM, Araneta MR, Pawlowsky SB, Barrett-Connor E, Grady D, Vittinghoff E, et al. Restorative yoga and metabolic risk factors: the Practicing Restorative Yoga vs. Stretching for the Metabolic Syndrome (PRYSMS) randomized trial. *J Diabetes Complications.*

- 2014 May-Jun;28(3):406-12. doi: 10.1016/j.jdiacomp.2013.12.001. Epub 2013 dec 10.
32. Stuckey MI, Gill DP, Petrella RJ. Does Systolic Blood Pressure Response to Lifestyle Intervention Indicate Metabolic Risk and Health-Related Quality-of-Life Improvement Over 1 Year? *J Clin Hypertens.* (Greenwich). 2015 May;17(5):375-80. doi: 10.1111/jch.12531. Epub 2015 Mar 10.
33. Lau C, Yu R, Woo J. Effects of a 12-Week Hatha Yoga Intervention on Metabolic Risk and Quality of Life in Hong Kong Chinese Adults with and without Metabolic Syndrome. *PLoS One.* 2015 Jun 25;10(6):e0130731. doi: 10.1371/journal.pone.0130731.
34. Zhang JP, Pozuelo L, Brennan DM, Hoar B, Hoogwerf BJ. Association of SF-36 with coronary artery disease risk factors and mortality: a PreCIS study. *Prev Cardiol.* 2010 Summer;13(3):122-9. doi: 10.1111/j.1751-7141.2009.00061.x.
35. Rouch I, Achour-Crawford E, Roche F, Castro-Lionard C, Laurent B, Ntougou Assoumou G, et al. Seven-year predictors of self-rated health and life satisfaction in the elderly: the PROOF study. *J Nutr Health Aging.* 2014 Nov;18(9):840-7. doi: 10.1007/s12603-014-0488-2.
36. Tsai AG, Wadden TA, Sarwer DB, Berkowitz RI, Womble LG, Hesson LA, et al. Metabolic syndrome and health-related quality of life in obese individuals seeking weight reduction. *Obesity.* (Silver Spring). 2008 Jan;16(1):59-63. doi: 10.1038/oby.2007.8.
37. Lee YJ, Woo SY, Ahn JH, Cho S, Kim SR Health-Related Quality of Life in Adults with Metabolic Syndrome: The Korea National Health and Nutrition Examination Survey, 2007–2008. *Ann Nutr Metab.* 2012;61:275-80. doi: 10.1159/000341494.

Received: May 3<sup>rd</sup> 2016

Accepted: Sept. 23<sup>rd</sup> 2016

---

Corresponding Author:  
Patrícia Pozas Saboya  
Pontifícia Universidade Católica do Rio Grande do Sul  
Av. Ipiranga, 6690  
Jardim Botânico  
CEP: 90610-000, Porto Alegre, RS, Brasil  
E-mail: patricia.saboya@acad.pucrs.br

**Copyright © 2016 Revista Latino-Americana de Enfermagem**

This is an Open Access article distributed under the terms of the Creative Commons (CC BY).

This license lets others distribute, remix, tweak, and build upon your work, even commercially, as long as they credit you for the original creation. This is the most accommodating of licenses offered. Recommended for maximum dissemination and use of licensed materials.