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Original Research

- Impacts of endovenous laser ablation on neovascularization in treatment of ch venous insufficiency (CVI)
 Leyla Bahar
 Int J Med Rev Case Rep. 2020; 4(5): 1-5
- » Abstract » PDF » doi: 10.5455/IJMRCR.ENDOVENOUSLASERABLATIONC
- The correlation of liver fibrosis severity with estimated glomerular filtration rate alcoholic fatty liver diseases

Safitri Ammarie, Hasyim Kasim, A M Luthfi Parewangi, Syakib Bakri, Haerani Rasyid, Seweng

Int J Med Rev Case Rep. 2020; 4(5): 6-10

» Abstract » PDF » doi: 10.5455/IJMRCR.LIVER-FIBROSIS-SEVERITY

3. DD genotype of the I/D Angiotensin-Converting Enzyme Gene Polymorphism is Risk for Atopic Asthma

Harun Iskandar, Syakib Bakri, Budu Mannulusi, Ilham Jaya Patellongi

Int J Med Rev Case Rep. 2020; 4(5): 11-14

» Abstract » PDF » doi: 10.5455/IJMRCR.atopic-asthma-ace-gene-polymory

 Lymphocyte level in various clinical manifestations of systemic lupus erythema Muhamad Fauzan, Faridin HP, Tutik Harjianti, Syakib Bakri, Hasyim Kasim, Haerani Ra

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Muhammad Ilyas, Arifin Seweng Int J Med Rev Case Rep. 2020; 4(5): 15-19 » Abstract » PDF » doi: 10.5455/IJMRCR.Lymphocycte-Level-Clinical-Manifestations-of-SLE

 Hematological profile of Patients in Udayana University General Hospital Cokorda Agung Wahyu Purnamasidhi, Pande Putu Ayu Patria Dewi, I Wayan Aryabian Int J Med Rev Case Rep. 2020; 4(5): 20-23

» Abstract » PDF » doi: 10.5455/IJMRCR.Hematological-profile-Patients

 Association between microalbuminuria and hypertension among type 2 diabete patients attending Benue State University Teaching Hospital, Makurdi, North C Nigeria

Monday Ogiator, Joseph Ojobi, Ochoche Ijachi, Paul Asor

Int J Med Rev Case Rep. 2020; 4(5): 24-28

» Abstract » PDF » doi: 10.5455/IJMRCR.microalbuminuria-diabeteshypertension

Review Article

 Intervention in Preventing and Managing Metabolic Syndrome in Community-Ba A Systematic Review

 I Ketut Tunas, I Putu Eka Widyadharma
 Int J Med Rev Case Rep. 2020; 4(5): 29-34

» Abstract » PDF » doi: 10.5455/IJMRCR.Intervention-Preventing-and-Mai Metabolic-Syndrome

 Treatment Options for Complications of Sickle-cell Disease in Children Cylia Evda Deckous Dassy, Manou Irmina Saramba, Dongchi Zhao Int J Med Rev Case Rep. 2020; 4(5): 35-44

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Intervention in Preventing and Managing Metabolic Syndrome in Community-Based Adults: A Systematic Review

I Ketut Tunas* and I Putu Eka Widyadharma**,1

*Doctoral Program, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia., **Department of Neurology, Faculty of Medicine, Udayana University, Denpasar, Bali, Indonesia.

ABSTRACT Background: Various efforts have been made in preventing and managing metabolic syndrome, one of which is lifestyle behaviours changing. Lifestyle intervention models, such as regulating nutrition and diet, increasing physical activity, education in the health sector have been widely developed in preventing metabolic syndrome by decreasing its components such as obesity, dyslipidemia, blood sugar and hypertension. **Objective:**to assess the intervention model in preventing and managing metabolic syndrome in community-based adults. **Method:** three databases have been selected in this study as sources of review such as Pubmed, Proquest and CINAHL (Ebsco), which have been published between 2006 and 2015 for data related to interventions in preventing metabolic syndrome in community-based adults. **Results:** ten articles related to interventions in preventing and managing metabolic syndrome in adults were reviewed based on eligibility criteria which consist of 3 randomization controlled trials (included in this study are pre-test post-test controlled designs), and 1 time series article with an intervention only in one sample group. Most articles (8 articles) indicate to lifestyle interventions that include increased physical activity, diet and nutrition, with the main objective is to prevent an increase in metabolic syndrome status.

KEYWORDS intervention, prevention, metabolic syndrome, adult, community

Introduction

Metabolic syndrome is a group of symptoms that indicate a higher risk of cardiovascular events for the individual [1]. These symptoms consist of central obesity, atherogenic dyslipidemia (high triglyceride levels and low level of High-Density Lipoprotein (HDL) cholesterol), hypertension and abnormal plasma glucose. There are several known criteria for establishing the diagnosis of metabolic syndrome (MetS), namely: criteria based on

Copyright © 2020 by the Bulgarian Association of Young Surgeons DOI:10.5455/JJMRCR.Intervention-Preventing-and-Managing-Metabolic-Syndrome First Received: January 12, 2020 Accepted: January 20, 2020 Manuscript Associate Editor: Ivan Inkov (BG)

¹I Putu Eka Widyadharma Ph.D.; Jalan Tukad Asahan No 2 Panjer; 623618959800; Email: eka.widyadharma@unud.ac.id https://orcid.org/0000-0002-4554-0348 the World Health Organization (WHO) (1998), National Cholesterol Education Program Adult Treatment Panel (NCEP ATP) III (2001) and International Diabetes Federation (IDF) (2005) [2,3]. The prevalence of MetS in the USA at age >20 is estimated to be around 25% and at age >50 is 45%, the incidence of MetS increases with age. In China, research-based on MetS IDF diagnosis criteria are around 23.2% and NCEP / ATP III around 16.2%. Factors causing MetS are still being investigated, but insulin resistance and central obesity are the two main factors. Other contributing factors are genetic, lifestyle, diet, lack of physical activity, sedentary behaviour, aging, pro-inflammatory conditions, and hormonal changes that more dependent on ethnic populations [4].

Health problems associated with overweight and obesityrelated to the risk of MetS are a significant risk factor for increased in morbidity and mortality in the world, including in Indonesia. In 2008, the prevalence of obesity had doubled from 1980. In 2011, it was found that over 40 million children under the age of five were overweight [5]. Several clinical studies provide clues that visceral or central obesity (intra-abdominal) can be used to predict the onset of type 2 diabetes mellitus, cardiovascular disease and stroke. Waist circumference is a reflection of visceral adipose tissue. Those who have larger waist circumference will have a lower level of adiponectin. Various interventions have been carried out in preventing the occurrence of metabolic syndrome. Several studies related to interventions in preventing the metabolic syndrome, including Jenkins et al. (2006) who assessed the success of diets to reduce cholesterol. It was further stated that a regular diet can prevent dyslipidemia. Furthermore, Wister (2007) states that lifestyle interventions can significantly reduce the incidence of cardiovascular disease [6].

Purpose

The purpose of this systematic review is to assess the intervention model in preventing and managing metabolic syndrome in community-based adults.

Method

This systematic review refers to the Guideline Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) [7].

Eligibility Criteria

This paper only refers to the publication of articles published in the English language and has been reviewed by a group of reviewers. The main inclusion criteria related to the topic are articles that contain interventions, prevention of increasing metabolic syndrome status, community-based and adults. The article must also meet the inclusion criteria as follows:

- 1. Concerning the problem of metabolic syndrome.
- 2. Contains intervention programs for handling or preventing metabolic syndrome.
- 3. The intervention program discussed in the article has been completed.
- 4. The study was conducted from 2006 to 2015.
- 5. The study examines community-based intervention programs. While the exclusion criteria used are if the article contains measurements of outcomes outside the component of metabolic syndrome.

Resources

The identification in this search is based on an electronic database, related to the reference lists. In conducting this systematic review, the database that we used is Medline (PubMed), ProQuest, and CINAHL (Ebsco). Searches were carried out for articles that were reviewed by peer reviewers.

Search Strategy

In searching on PubMed, we used the keywords: "metabolic syndrome [title/abstract] AND intervention AND prevention AND community AND adults". In searching using these keywords, the authors did not find a review related to the topic of this intervention. Therefore, for consideration, we used the development of the number of articles that exist until 2015, the



Figure 1: Search Results and Data Selection.

authors use a strategy by comparing the number of articles in the search time span between 1990-2015, 2000-2015, 2006-2015 and 2011-2015. There are no significant differences in the number of articles found between 1990-2015 and 2006-2015. While from 2011 through 2015, there are only a few numbers of articles that were found. Based on the number of articles in the period searched, we used the period in 2006-2015 (10 years). In searching on Proquest between 2006 and 2015, we used the keywords: "metabolic syndrome [title/abstract] AND intervention AND prevention AND community AND adults", as well as in CINAHL (Ebsco) between 2006 and 2015 with the keyword: "metabolic syndrome [title/abstract] AND intervention AND prevention AND community AND adults".

Data Selection

The selection is based on the title and abstract obtained in the search strategy. Analysis in reviewing titles and abstracts is done by giving code 1 for "Yes or entering eligibility criteria", code 2 for "possibly applicable" and code 3 for "not in criteria ". Selection for title duplication is done with EndNote and also done manually to sort the possibility of a title having the same or similar context. The coding of selected articles is based on inclusion and exclusion criteria. Abstracts which are coded with 1 or 2 are traced back to get the full text and then reviewed again and assisted with the excel program in determining eligibility status.

Data Extraction

Data extraction for each article includes the author and year, research design, intervention group, sample size, age and outcome measurement. The process and flow in this systematic study can be described in the following flowchart in Chart 1.

 Table 1 Systematic Review Matrix.

Author, year	Study Design	Intervention	Sample	Age	Length	Result
		Lifestyle	-		orstudy	Measurement
Azizi et al., 2013	Nonrandomized controlled trial	intervention, including physical activity, nutrition and diet and smoking Control	2961 people 3909 people	20-74 years old	3.6 years	Abdominal obesity, blood sugar, triglyceride, HDL and blood pressure
Fukumoto et al. 2013	Randomized controlled trial	Lifestyle intervention consists of two programs : Initiation program Total program Control	83 people 88 people 39 people	40-69 years old	1 year	BMI, blood sugar, triglyceride, HDL and blood pressure
Fujii, et al., 2009	Nonrandomized controlled trial	Lifestyle intervention, including : Nutrition and physical exercise and newsletter Control (newsletter)	207 people 182 people	40-71 years old	27 months	BMI, blood pressure, blood sugar, triglyceride and HDL
Kim et al., 2014	Pre-test post-test controlled quasy experimental design	Community based intervention (CBI) Control	49 people 43 people	60-84 years old	8 weeks	Abdominal circumference, blood sugar, triglyceride, HDL and blood pressure
Gilstrap et al., 2012	Time Series Study	Lifestyle intervention including physical exercise, nutrition, psychology and smoking	64 people	40-60 years old	1 year and 2 years	Blood sugar, triglyceride, HDL and blood pressure
Jahangiry, et al. 2015	Randomized controlled trial	Web-based interactive program intervention about metabolic syndrome Control (General information about metabolic syndrome)	80 people 80 people	35-60 years old	6 months	Bodyweight, abdominal circumference, BMI, blood sugar, total cholesterol, triglyceride, HDL, LDL and blood pressure

Liu et al. 2015	Nonrandomized controlled trial	Low-intensity lifestyle modification intervention including diet, physical activity, and interactive session Control (without an interactive session on diet and physical		30-45 years old	6 months	Bodyweight, BMI, blood sugar, total cholesterol, triglyceride, HDL, LDL and blood pressure
Lin. 2012	Pre-test post-test controlled trial (Quasy experimental)	Regular community based physical activity program intervention	73 people	40-65 years old	1 year	Bodyweight, BMI, blood sugar, total cholesterol, triglyceride, HDL, LDL and blood pressure
Seidel et al., 2008	Nonrandomization prospective	Program intervention group balanced life style	88 people	40-65 years old	12 months	Bodyweight, BMI, blood sugar, total cholesterol, triglyceride, HDL, LDL and blood pressure
Telle- Hjellset et al., 2013	Randomization controlled trial	Physical activity, diet intervention, blood sugar education Control	101 people 97 people	25-62 years old	1-3 months	Bodyweight, BMI, blood sugar, total cholesterol, triglyceride, HDL, LDL and blood pressure

Results

The total amount of articles obtained was 119 articles, sourced from three databases namely: Pub Med (47 articles), Proquest (37 articles) and Ebsco (35 articles). Forty-one articles were obtained from screening the title, which will be further reviewed according to the inclusion and exclusion criteria. Further analysis based on abstracts, we obtained ten articles that were fully reviewed with a focus on intervention. The search results are presented in Chart 1 and an analysis of 10 articles is presented in the form of a matrix in Table 1. In (Table 1), it is found that eight articles use lifestyle interventions that include increased physical activity, diet and nutrition and only one article includes smoking activities, with the primary purpose is to prevent an increase in the status of metabolic syndrome. The research samples are adult male and female with age range 20-84 years. The number of samples in the articles reviewed ranged from 40-3000 people.

Based on Azizi, et al. (2013), lifestyle interventions that include increased physical activity, diet and nutrition and a reduction in the overall number of smokers can prevent or decrease all components in metabolic syndrome except blood pressure which is not significant between the intervention group and the comparison group [8]. This study involved a fairly large sample of nearly 7000 people who were followed up from about 15.005 people conducted in a cohort study of lipids and glucose with large range of ages between 20-74 years.

Telle-Hjellset et al. (2013) state that cultural adaptation education programs can prevent an increase in the metabolic syndrome component compared to the control group, which involves Pakistan immigrant women [9]. In general, lifestyle interventions that include several variables such as increased physical activity, diet and nutrition, and those that are only single variables such as physical activity alone can prevent the increase in metabolic syndrome [10-12]. Whereas Fukumoto et al. (2011), in his study stated that lifestyle intervention through self-motivation in Japanese society for 11 months, they obtained that only the level of random blood sugar was significantly different between the intervention group and the control group, while other metabolic syndrome components were not significant [13]. Similar results were also shown in Fujii et al. (2009) study. It was found that there was no difference in most of the components of metabolic syndrome in both men and women between the intervention group and the control group. This study also intervened in the lifestyle of Japanese people with a duration of about 27 months [14].

Likewise the research of Kim et al. (2014), there are not much different from Fukumoto et al. (2011) and Fujii et al. (2009), but there was a significant decrease in waist circumference and an increase in HDL cholesterol. Besides the component of metabolic syndrome, Kim et al. (2014) also reported a significant improvement of self-caring behaviour in elderly [13-15]. Gilstrap also

found that there were not much different from the three studies above. He stated that there was a significant decrease in the score or status of metabolic syndrome between baseline within one year and within two-year follow-up, but most of the components the metabolic syndrome did not decrease, except for decreased in blood pressure and significantly increased in HDL cholesterol [16]. In Jahangiry, et al., (2015) study, also has varied results. It was found that body weight, BMI, blood pressure (systole and diastole) and HDL differed significantly between the control group and the intervention group. This study also carried out interactive lifestyle interventions in web-based for 3 and 6 months [17].

Discussion

This systematic review from 10 articles, consist of 3 randomizations controlled trials, six non-randomization controlled trials (included in this study is a pre-test post-test controlled design) and one-time series article (intervention only in one sample group). Eight articles lead to lifestyle interventions that include increased in physical activity, diet and nutrition and only one article include smoking activities, with the main purpose, is to prevent an increase in metabolic syndrome status. All articles in this review involve adult men and women aged 20 - 84 years. The samples size involved in the study ranged from 40-3000 people. The interventions varied from short-term (1-3 months) and long-term (3.6 years). A total of 7 articles used intervention based on the community with the main target is the population in the residential area, and two articles were in the diffuse area and one is web-based community article.

Based on the results of the above study, there is one similarity in interventions to prevent metabolic syndrome which is focused on lifestyle. These lifestyle interventions are specified into several indicators that are relevant to the settings in each of the research communities. Lifestyle interventions as a community will provide a more significant impact on the expected behaviour changes. In this study, there is one web-based that is interactive via the web. The duration of the studies mostly took a quite long time (between 6 months to 3.6 years) although there was one study of which duration was only 1-3 months. This data can indicate that the expected changes that occur in the component of the metabolic syndrome do take a long time. Besides, the sample size which involved is also very large that affects the overall cost of the research.

The results of the review of 10 articles above are indeed limited to lifestyle interventions, and there are no more complex variations. The measurement of the results is only related to the components of the metabolic syndrome and one result that increase the efficacy and self-care. The role of a motivator and the role of community coordinators in increasing their participation in the lifestyle-changing is not seen yet. Furthermore, there is no role of community engagement in this review. The role of local wisdom has also not been seen in lifestyle behaviour changes. The authors also have not found any research on the cost-effectiveness of interventions in this study.

Conclusions and Suggestions

Lifestyle intervention in the prevention and management of metabolic syndrome is one of the effective intervention models. Lifestyle intervention will affect all activities related to diet, activity and nutritional supply. These are associated with the metabolic syndrome itself, which is a risk factor of several chronic diseases. Lifestyle is a behaviour which actually can be modified, but it required a long period to achieve the expected result. The most feasible lifestyle intervention is a combination of health education, nutrition and diet, and physical activity or exercise. However, this concept of intervention is still can be expanded. Lifestyle interventions are varied and many factors can affect the measurement result. People can use their social media to make a suitable result according to the condition and surrounding of that society so that the cost-effectiveness can be enhanced. Raising the spirit of the people to change into a healthier lifestyle is our challenge as a society, this can be developed and evaluated through community engagement, including groups of people and communities which have a same vision and mission to achieve the expected goal.

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