Effectiveness of Planned Nursing Intervention on: BMI and Physiological Parameters Among Women with Obesity

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Abstract: Obesity is the leading cause of death in worldwide, 1 in 8 population living with obesity in 2022. Obesity is leading cause that may increases the threat of non-communicable disease and effect on the individual's quality of life such as sleeping or moving. To prevent from the complication, the lifestyle modification including exercise and dietary management is acceptable measure to reduce the obesity and its complication. To assess the effectiveness of nursing intervention on BMI and physical parameters 12 study are critically selected by using different database according inclusion criteria. The result shows that the physical exercise such as Zumba, Pilates, step aerobics, and resistance training significantly decrease BMI, enhance blood pressure, and improve glucose and lipid profiles among various populations. Aerobic training decreases body fat and BMI, whereas resistance exercise training enhances insulin sensitivity, particularly in diabetic patient. Together with diet counseling and behavior therapy as an intervention also lower obesity-related risks like hypertension and high cholesterol levels. In general, the incorporation of exercise with lifestyle change supports weight control, metabolic related health, and decreases risk of chronic disease. These results highlight the significance of combining exercise with dietary intervention and lifestyle change to secure total health benefits, stressing the role of individualized and continuous exercise regimens in controlling weight, improving metabolic function, and decreasing chronic disease risk at different ages and medical condition.

Keywords: Obesity, Effectiveness, BMI, Aerobic Exercise.

I. INTRODUCTION

Worldwide the obesity is extensive and has spreading worsen from past five decades and it is the secondary cause of death after smoking. (1). Obesity can be introduce that the extravagant deposition of fat in body as well as tissue and different organ and that can lead to the serious disease and death . (2). Obesity is leading cause that may increases the threat of non-communicable disease and effect on the individuals quality of life such as sleeping or moving (3). There is a relationship between obesity and several chronic and noncommunicable diseases such as asthma, cerebrovascular attack or stroke, cholecystitis cholelithiasis, chronic low back pain, coronary heart disease diabetes Type II, heart failure, high blood pressure, non-alcoholic fatty liver, sleep related breathing disorder such as obstructive sleep apnea, osteophytes, pulmonary embolism. (4).

Worldwide 1 in 8 population living with obesity in 2022, that more than twice since 1990 and there has been an increase of 4 times adolescent obesity. worldwide 43% population with age group 18 years above age adults were suffering from overweight and 16% obesity. In 2022, approximately 37 million children aged five years and below were reported to be overweight. Greater than 390 million and adolescents and children with aged 5-19 had excessive weight whereas 160 million of them were affected by obesity.(3). In India 24% of female and 23% male. Obesity in women, 15 to 49 years, is reported to be approximately 5%, but it is suggested that 30-37% of women aged 40-49 years suffer from obesity, with varying proportions based on socio-economic factors such as population density. In urban populations, the prevalence is reported at 33%, while in rural populations, considerably lower at 20%. Puducherry state apparently has the highest prevalence among women reporting poor body images: 46% of women suffer from the overweight or obesity condition; followed by women from Chandigarh 44%, Delhi, Tamil Nadu, Punjab state 41% each, and Kerala Andaman & Nicobar islands 38% each. (5). Similarly in Nepal among the adolescence age 15- 19 years, 6% women and 7% men were overweight and obese and among 20-49 years age population 34% women and 32 men are overweight and obese. The highest proportion seen among 40–49 years of age that is 44%.(6).

The condition, obesity is classified as average weight, over weight and obesity. The central obesity or abdominal obesity is measured by certain tools. (7)The tools for measurement of obesity are body mass index (BMI), fat mass and distribution of fat by measurements of height and body weight and waist and hip measurement (2). BMI is measures in weight (kg) is divided by height^2 (m²). For adults, WHO defines BMI leaser than 18 kg/m^2 is considered as below weight , qual or more than 18.5 and less or equal to 24.9 kg/m^2 is consider as normal weight, equal or greater than 25 and up to 29.9 kg/m^2 is considered as overweight and more or equal to 30 kg/m^2 is obesity" (3), If the BMI is equal and greater than 40 kg/m^2 consider as a extreme obesity, and also called morbid obesity .(7)

Fat distribution in body is important to identify the metabolic effect in the body. The fat distribution is measured in various way, waist circumference measurement is also one of the methods of fat distribution measurement in abdomen. If the measurement of waist circumference is more than 102 cm or 40 inches in male and 88 cm or 35 inches in female are greater chance to develop the non-communicable diseases. The waist circumference measures the fat accumulation in abdomen is considered as central or abdominal obesity which may be high risk for developing the diseases in the person even with the normal BMI (2). Waist to hip ratio (W/H) also measured to identify the abdominal obesity more than 1:1 in men and more than 1:0.85 in women are indicate the obesity. The measurement of waist circumference can be taken in midpoint from the point of iliac crest of pelvic gridle and costal margin and for the measurement of hip circumference the widest point of hip should be measured.(8).

To prevent from the complication, there are different approaches to management of obesity. Beside pharmacological and surgical management the lifestyle modification is the best approaches to prevent and treatment of obesity. It involves the meal planning to maintain dietary management and exercise (4). To modify the Lifestyle should consume healthy diet, regular exercise, maintain sleep quality, and minimization of stress for the weight maintenance. For the weight reduction the energy deficit diet plan should be done, to lose five-hundred-gram weight in seven days, there should be reduced 4500-kcal for seven days or 642 kcal in one day. The calorie cut off can be done by either decreasing food intake (dieting) or increasing physical activity like aerobic exercise restrain activity. (9).

Aerobic exercise is the exercise that allow to breath and enter enough oxygen into the body helps the heart to enough pumping so it is also called cardiac exercise. With the presence of oxygen body creates the energy by using stored carbohydrate and fats so it results in possible weight loss, lower the blood glucose and lipid level. There are several types of aerobic exercise among them Zumba dance is also one of the types of aerobic exercise (10). Zumba ais the Latin dance and fitness training helps to enhancing balance, gait, fitness, cardio and coordination. It is the highly choreographed dance mix with aerobic exercise. The Zumba dance was starts as fitness aerobics class from United States in 2001 by Alberto who was Colombian dancer. It is 45- 60 min dance starting with 10 min warm up 30 min fast intense dance and 5-10 min closing wrap dance which is highly choreographed by Zumba certified trainer with western music(11). A research problem that guides this review was to assess the effectiveness of nursing intervention to BMI and physical parameters (waist circumference, hip circumference, blood glucose level and triglyceride).

➢ *Operational Definition*
- Nursing intervention: Health education regarding diet plan with booklet with diet chart and exercise with Zumba dance 60 minutes aerobic step dance with music
- BMI: the BMI (Body Mass Index) is calculated as the weight in kg is divide by height in meter^2 (m²).
➢ For adults, WHO defines BMI:
➢ below 18 kg/m^2 is under weight,
➢ 18 .5–24.9 kg/m^2 is normal weight
➢ 25 -29.9 kg/m^2 is overweight and
➢ more than or equal to 30 kg/m^2 is obesity
- Physiological parameters: including
➢ Waist circumference: measured in midpoint from the iliac crest and costal margin. The normal value: below 100 cm for men below 88 cm for women.
➢ Hip circumference: measured at the widest point of hip by using measuring tools.
➢ Waist to hip ratio (W/H): 1:1 for men, 1:0.85 in women.
➢ Fasting blood sugar level: blood sample taken in empty stomach early in the morning. Normal value is 70mg/dl to 100mg/dl.
➢ Triglyceride level: blood sample. less than 150mg/dl.

II. METHODOLOGY

The study designed as a narrative review. A systematic electronic search used to identify the relevant studies. The 12 study critically selected through different database in this review according to inclusion criteria. The primary research only included in this study. The electronic database searched are: PubMed, Scopus, Google Scholar, Clinical key and Research Gate. All the previous literature were selected very systematically to be included in this review.

➢ *Inclusive criteria*
* The articles that are directly belong to effectiveness of exercise and diet to reduce BMI among obesity.

* The research paper that directly belong to effectiveness of Zumba dance to reduce BMI and blood glucose.
* The research paper which was easily available in online and full text.
* A research paper which is completed in English language.
* A research article which is published 2019 onwards.

➢ *Exclusive criteria*
* Poor quality of journal publication.
* An article which was published in journal which does not have ISSN number.
* An article which published in local language.

III. RESULT AND DISCUSSION

Table 1: Result of Literature Search and Included in Review

Author	Title	Design	Sampling technique and size	Result	References
İmamoğlu and Özdenk (2019)	The Effect of 12-Week Regular Pilates, Step and Zumba Training Program on Muscle and Fat Weight'	Experimental Study. (12-week intervention)	probability random sampling technique. 60 women	The result shows that the measurement of fat tissue in leg abdomen arms and total body fat is decreased after intervention of different type of exercise ($p<0.05$). Among Pilates and step exercise, as the Pilates and step exercise is more effective than Zumba dance.	12
Saleh and Ljubojević, (2019)	Effects of 12-weeks Zumba lessons on some anthropometric Parameters for women and men.	Interventional study (The Zumba Lessons was performed for 12 weeks)	non probability sampling technique (21 men and women)	there are significant changes in weight in women($P=0.009$) and men ($p=0.005$), in body fat men ($P=0.041$) and female ($P=0.005$) and BMI ($P = 0.020$) of female and ($P=0.038$) of men after the intervention. It is more effective in women than men, as the women decrease BMI in 8 week and men needed 12 weeks. It is suggested that the Zumba dance is effective to reduce the body weight if it is done regular for more than 12 weeks.	13
Mahendrasinh ZN, Pandya R, Chauhan A. (2022)	The Effects of Zumba Dance and Low-impact Aerobic Exercise on Body Fat Percentage in Patients with Obesity	An interventional study (low impact aerobic exercise and low-impact aerobic dance exercise (Zumba dance) for 1 month)	Convenient sampling technique 30 (15+15) of age group 25 to 40 years patients of obesity	The pre-test and post-test BMI mean score is 24.784 and 21.158 of Zumba dance group. similarly aerobic group pre- test and post-test BMI mean score mean is 24.443 and 19.512. aerobic exercise is more effect on BMI than Zumba dance.	14
Ljubojevic *et al.*, 2023	The Effects of Zumba Fitness® on Respiratory Function and Body Composition Parameters: An Eight-Week Intervention in Healthy Inactive	Experimental research design (8-week choreographed Zumba dance)	random sampling technique 41bank administrator inactive women aged 35 to 45years	The 8-week Zumba fitness training was significantly effective to lower mass of the body ($p=0.03$), BMI ($p=0.01$) and mass of fat ($p=0.03$). The Zumba exercise is also effective to improve respiratory function	15

	Women				
Huifen *et al.*, 2022	Effects of moderate-intensity resistance exercise on blood glucose and pregnancy outcome in patients with gestational diabetes mellitus: A randomized controlled trial	(especial exercise for pregnant women for 6 week) A Randomized Control Trial	Random sampling technique (99 patients who is diagnosed with gestational diabetes mellitus)	There is a significant effect seen among experimental group on fasting blood sugar and 2-hour postprandial blood sugar ($P < 0.05$), amount of insulin and the insulin utilization rate ($P < 0.05$), gestational weight gain ($P < 0.05$). The nutritional education and moderately intensity resistance exercise is effective for lowering blood sugar, the rate of utilization of insulin, gestational weight gain amount and blood pressure.	16
Fernández-Ruiz *et al.*, 2020	Effectiveness of an Interdisciplinary Program Performed on Obese People Regarding Nutritional Habits and Metabolic Comorbidity: A Randomized Controlled Clinical Trial	A randomized controlled clinical trial (12-week interdisciplinary intervention)	Probability random sample technique 74 obese population	There is a significant positive effect on nutritional habits ($p < 0.001$), decrease in blood sugar Hb1Ac ($p < 0.001$) at 12 months and significantly reduction in BMI ($p < 0.001$) in 24 months after intervention including healthy eating, exercise, and cognitive behavioural therapy.	17
Li, J., Cheng, W. and Ma, H. (2022)	A Comparative Study of Health Efficacy Indicators in Subjects with T2DM Applying Power Cycling to 12 Weeks of Low-Volume High-Intensity Interval Training and Moderate-Intensity Continuous Training	A comparative study (12 weeks of HIIT and MICT)	Random sampling technique (96 type 2 diabetic patients aged 32 to 47 years)	The MICT ($P < 0:0$) was effect than HIIT ($p = 0:001$) in Body Mass Index and weight of the body. The study concluded that the exercise improved the health of individual.	18
Karbalamahdi *et al.*, 2019	Effect of Aerobic Training and C. vulgaris Intake on Lipid Profile and Leptin in Obese Women.	A comparative study (control, aerobic exercise training, Cholera vulgaris, and aerobic exercise training with C. vulgaris (AT+CV) groups (8 each)).	Probability random sampling (32 women with obesity)	the weight of the body, BMI, and lipid profile is significantly improved after the application of in the aerobic therapy and aerobic therapy with Chlorella vulgaris ($P < 0.05$). There was not seen any contrast between the aerobic therapy and aerobic therapy with chlorella vulgaris groups ($P > 0.05$). The study concluded that aerobic exercise is effective in lipid profile and leptin reduction among women with obesity	19
Zhang, 2022	Effect of Exercise on Insulin Resistance in Obese Type 2 Diabetes Patients	A randomized control trial (6 months of intervention regarding quantitative exercise intervention)	Random sampling technique (86 obese and type 2 diabetic patient aged 27-62 years)	Weight of the body, BMI, serum glucose, lipids and insulin resistance were significantly improved in observational group ($P < 0.05$).	20
Luo X, Wang	Effect of resistance	Single-blind	Random sampling	Both interventional group, fasting	21

Z, Li B, Zhang X, Li X(2023)	vs. aerobic exercise in pre-diabetes: an RCT	randomized controlled trial (aerobic exercise and resistance exercise for 12 weeks)	technique (70 prediabetic patient)	plasma glucose lowered by 6.17% (P = 0.001) in aerobic group 4.81% (P = 0.019) in resistance exercise group, oral glucose tolerance test 2-h PG decreases with 20.39% (P < 0.001) in aerobic group and 16.50% (P < 0.001) in resistance. Each exercise is significantly effective (P < 0.001). Significantly lowered in the Body Mass Index (BMI) (P < 0.001) and waist circumference (P < 0.001) in aerobic group. Study concluded that both exercise is effective to lowered and improve IGR. Aerobic exercise is effective in blood glucose levels and weight loss.	
Hsu *et al.*, 2019	Effects of Regular Aerobic Exercise and Resistance Training on High-Density Lipoprotein Cholesterol Levels in Taiwanese Adults	Correlation study	24,856 Taiwanese adults aged 30 to 70 years from Biobank database	both aerobic (e.g., running, cycling) (p < 0.0001) and non-aerobic (e.g., resistance training, ball games, mixed exercise) (p < 0.0001) activities were positively associated with higher HDL-C levels, non-aerobic exercises, resistance training had the most significant impact (p = 0.0020). A variety of exercise types, including resistance training, can be effective in improving HDL-C levels and potentially reducing cardiovascular risks.	22
Connolly *et al.*, 2020	Impact of a novel home-based exercise intervention on health indicators in inactive premenopausal women: a 12-week randomised controlled trial	The randomized control trial (audio–visual assisted exercise training for 12 weeks)	Random sampling technique (24 inactive premenopausal women)	The observed group improved in HDL and mental wellbeing (P < 0.05). The study concluded that home-based audio- visual assisted exercise training programme is effective to physical health and mental wellbeing of physical inactive premenopausal women.	23

A 12-week trial by İmamoğlu and Özdenk (2019) 60 women aged 19 to 69 demonstrated that three times a week adherence to Pilates, Step aerobics, and Zumba exercise resulted in a significant decrease in fat tissue in the legs, abdomen, arms, and overall body fat (p<0.05). Likewise, study of Saleh and Ljubojević (2019) a 21-participant (11 females and 10 males) performing

Zumba three times a week for 12 weeks ha ssignificantly decreased women's body weight (p=0.009) and men's body weight (p=0.005), body fat in women (p=0.005) and men (p=0.041), and BMI in women at week 8 (p=0.020) and in men at week 12 (p=0.038), measure with TANITA BC-780A analyzer. Ljubojevic et al. (2023) demonstrated that 8 weeks of Zumba effectively decreased body mass (p=0.03), BMI (p=0.01), and fat mass (p=0.03), and enhanced respiratory function among sedentary women aged 35–45.

The study of Mahendrasinh, Pandya, and Chauhan (2022) discovered that low-impact aerobic exercise had a greater decrease in BMI compared to Zumba dance in obese adults between 25 to 40 years old with a decline in BMI from 24.443 to 19.512 in the aerobic group compared to 24.784 to 21.158 in the Zumba group. Huifen et al. (2022) demonstrated that in gestational diabetes mellitus patients, a blend of nutritional education and moderate-intensity resistance exercise considerably enhanced fasting and postprandial blood glucose levels, insulin action, gestational weight gain, and blood pressure (p < 0.05). These results suggest that both aerobic exercise and resistance exercise, population- and condition-specific, enhance BMI, metabolic wellbeing, and physiological processes in obese and related groups. The Fernández-Ruiz et al. (2020), considered that long-term increases in BMI, HbA1c, and eating habits via a multidisciplinary treatment program (p < 0.001), and Li et al. (2022), who showed that moderate-intensity continuous training was superior to high-intensity

interval training for decreasing BMI in diabetic patient. Parallel to this, Karbalamahdi et al. (2019) showed that aerobic exercise, with or without supplementing Chlorella vulgaris, enhanced BMI and lipid profiles (p < 0.05).

Zhang (2022) showed that a six-month glycemic load-based quantitative exercise intervention significantly enhanced body weight, BMI, serum glucose, lipid, and insulin resistance in obese and type 2 diabetic patients in China (P < 0.05). Likewise, Luo et al. (2023) found that aerobic and resistance exercises were equally effective for lowering fasting plasma glucose—by 6.17% for the aerobic (P = 0.001) and by 4.81% for the resistance group (P = 0.019)—and 2-hour post-glucose and BMI (P < 0.001), with aerobic exercise having more favorable effects on weight loss and glycemic control. Hsu et al. (2019), with a large population-based sample, reported that both non-aerobic and aerobic exercises substantially elevated HDL-C values (p < 0.0001), with resistance training exerting the greatest effect of non-aerobic forms (p = 0.0020), suggesting better cardiovascular health. Connolly et al. (2020) also demonstrated that a home-based audio–visual supported exercise program over a 12-week period substantially enhanced HDL-C and mental health (P < 0.05) in inactive premenopausal women.

Taken together, these findings provide evidence for the benefit of different types of organized physical activity and dietary intervention or multidisciplinary intervention in enhancing metabolic and cardiovascular health as well as body weight, other parameters and blood sugar outcomes in diverse populations.

IV.   CONCLUSION

There are variety of physical activity and exercise interventions have shown significant positive effects on body composition, metabolic health, and cardiovascular risk factors across different populations. Studies consistently demonstrate that exercises like Zumba, Pilates, step aerobics, and moderate-intensity resistance training effectively reduce BMI. improve BP, lower fat percentage, as well as enhance biochemical markers such as glucose and lipid profiles. For instance, Zumba and low-impact aerobic exercises have been linked to significant reductions in BMI and body fat, while resistance training has shown promise in improving insulin resistance and blood glucose levels, particularly among individuals with diabetes or gestational diabetes.

Moreover, nutritional education and multidisciplinary interventions incorporating physical activity, dietary counseling, and behavioral therapy has effectiveness to improve the morbidity caused by obesity, like high blood pressure and elevated cholesterol. These findings suggest that integrating exercise with nutrition education and lifestyle modifications can be comprehensive effect on health, highlighting the importance of regular physical activity in managing weight, improving metabolic function, and reducing the risk of chronic diseases. Overall, these studies reinforce the value of personalized, consistent exercise

programs and their role in promoting long-term health and well-being across various age groups and conditions.

➤ *Scope for Further Research*
The further study regarding knowledge attitude and practice can be assessed prior to intervention of educational programme similarly the probability random sampling technique with adequate sample size will help to assess the real effect of intervention regarding obesity reduction. The study can be done with homogenous group such as in age, sex etc. The intervention can be done in regular basis to measure the effectiveness.

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