

Effectiveness of balance training program in improving the functional mobility and risk of fall in obese and osteoporotic patients

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ABSTRACT

Obesity is considered as a rising problem in India and around the world generally seen in individual having sedentary life style and at older ages and risk of Falls especially in osteoporotic population. In order to increase the quality of life in elderly & reduce the incidence of fall it becomes a health priority in clinical intervention. The patients were divided sequentially into two groups: the group who were to performed Borg balance training session Exercise Group (group A) consisting of 22 patients and other Control group (group B) consisting of 20 patients were oriented for risk of fall through a seminar and calcium substitutes were advised for osteoporosis. With improvement seen in the functional mobility and functional balance there was also a significant difference seen with reduction in the frequency of fall in between groups supervised exercise followed by home based exercise protocol and regular telephonic follow-up proved to improve on functional mobility, functional balance and reduce frequency of fall.

INTRODUCTION

Obesity is considered as a rising problem in India and around the world generally seen in individual having sedentary life style and at older ages. Increase in body weight and sedentary lifestyle often lead to loss of cal-

cium deposits from bones thus causing osteopenia and osteoporosis (Benedetti et al., 2018, Marcucci et al., 2015) and increasing age and obesity becomes a contributory factor. The total population in India is above 1.3 billion, and approximately 10% of population are elderly, estimated around 50 million of Indian population are

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osteoporotic or having T-score less than -2.5. Recent studies also show that younger adults may also have osteoporosis (Denova-Gutiérrez et al., 2018, Ambrose et al., 2019), even though male population having common cause of mortality and morbidity the studies done are limited. In elderly obese and osteoporotic population often leads to prevalence of non-communicable diseases, further creating several socioeconomic issues acts as a burden to public health. Falls depend upon two factors i.e. intrinsic and extrinsic factors which comprises of poor balance, urinary incontinence, depression etc. and certain environmental factors respectively. Recent studies shows population with deficit balance is one of the biggest causes for fall in with a high correlation amongst it, (Ozcan et al 2005, Multani et al., 2010, Prato et al., 2017, Malhotra et al., 2018). In order to increase the quality of life in elderly & reduce the incidence of fall, it becomes a health priority in clinical intervention.

Besides this many studies recommend that regular exercises decreases the risk of fracture by increasing the bone density and mass, improving on muscle strength, maintaining good posture and therefore lessening the risk of fall (Senderovich et al., 2017). Whereas emphasis can also be made on maintaining and enhancing balance to prevent falls. In a sedentary lifestyle usually the lack of exercise and awareness about good balance is limited, (Chahal et al., 2018). Various studies also show that only exercise may or may not fulfil the role in reducing the incidence of fall and same is not significantly established in population suffering from osteoporosis. The aim of the study is to establish the effectiveness of balance training program in incidence, frequency of fall and functional mobility and in elderly osteoporotic female.

MATERIAL AND METHODS

42 female subjects were selected from R.L.J.T. Hospital, Churela. The patients with osteoporosis falling under bone mineral densitometry i.e. T score less than -2.5 according to WHO guidelines were included in the study. The patient's bone mineral densitometry tests were done for heel region. The subjects suffering from any neurological disorder, visual and auditory disorder and those women having secondary cause for osteoporosis, Patients using assistive aids and having knee osteoarthritis and other contraindication for which they cannot be included for duration of study were excluded.

The patients were divided sequentially into two groups: the group who were to performed Borg balance training session Exercise Group (group A) consisting of 22 patients and other Control group (group B) consisting of 20 patients were oriented for risk of fall through a seminar and calcium substitutes were advised for osteoporosis. All subjects who were included, procedure were

explained about the research and a written consent was occupied.

Demographic data: Personal and clinical details were collected through medical sheet, during assessment more focus was on recent history of fall and frequency of fall in previous years, any use of drugs related increasing risk of falls.

Functional mobility: To evaluate the functional mobility timed "up and go test" was used, the activities performed by the individual were getting up from the chair, walking for 3 meter and returning back to chair and sitting down again. The stipulated time for completion of the activities without a balance deficit is 0 seconds

Functional balance: The Berg balance scale was used, the scale consists of 14 items that are similar the activities of daily living. Total maximum score achieved is 56, reading were taken from 0-4 point. Scoring attained less than 45 were considered as diminished balance. The instrument used was a ruler, stop watch, a chair and step stool. Time to complete the activities maximum of 15 minutes per individual was given (Lima. et al., 2018).

Frequency of fall: The total number of fall in last 1 year was noted during the preliminary assessment, Patients were asked to document the number fall during the duration of the study. The difference between the two was calculated for both the groups. Procedure: The exercise protocol consists of 80 minutes of exercises performed in group once a week in supervision of a qualified physiotherapist. As per the patient age mild to moderate exercise were taught to them also there were ask to maintain a daily diary to mark the number of sessions the exercise were performed supervised and non-supervised for at least 12 weeks.

Patient preparation: Before training exercises patient were instructed to perform few stretching exercises and warm up exercises for at least 10-15 minutes consists of light stretching exercise included stretching of upper & lower extremities followed by walking combined with light movement exercises upper extremities.

Training protocol: 30-40 minute of balance exercises both in dynamic and static position were performed, included walking on toes followed by heels, tandem walking, side walking, walking with rising alternate hand and leg, static exercises included standing on a line and one leg standing (Howe et al., 2011, Multani 2011). Patients were instructed increase the duration of hold in the static exercises Non-supervised exercises :Patients were also instructed to repeat same exercises taught for minimum 30 minutes of exercises at home in front of mirror as a feedback for 3-4 times in a week, all were instructed to note the number of days the exercise were performed.

Data analysis:42 female subjects participated in the study with 22 subjects in group A and 20 subjects in

group B (5 out of total subjects enrolled for the study discontinued because of personal reasons and family engagements. the data was analysed using Chi-square test and Mann-Whitney, using SPSS software 2018 version. Significant level for P values at <0.05 was considered.

RESULTS AND DISCUSSION

Comparing the demographic details and history of disease parameters and previous treatment taken by the patients there was no significant difference found in the in between group A and group B as explained in table.1, similarly when the base line data was taken for exercises and control group there was no significant difference for Functional mobility (TUGT), Functional balance (BBS) and Frequency of fall in between both groups explained in table 2. The subjects selected in both the group adhered to the protocol and only one individual dropped out from the study.

Table 1. Illustrates about the demographic details of both groups noted at the onset of the study

Variables	Exercise Group Mean ± SD	Control Group Mean ± SD	P-Value
Age (years)	60.23 ± 3.94	61.3 ± 4.25	0.412**
H/o Fracture	0.380 ± 0.49	0.35 ± 0.48	0.842**
Drug History	0.57 ± 0.50	0.7 ± 0.470	0.406**
Hypnotics Drugs	0.71 ± 0.46	0.55 ± 0.510	0.287**
T- Score (Heel)	-2.75 ± 0.16	-2.705 ± 0.17	0.373**

Data expressed in means ± SD
 * Significant
 **Non-Significant

Table 2. Illustrates the Reading recording at the onset of the study for Timed “Up & Go” Test (TUGT), Berg Balance Scale (BBS) and frequency of fall in exercises and control group.

Outcome	Exercise Group n=21	Control Group n=20	P-value
Functional mobility (TUGT)	48.19±3.23	47.83±4.33	0.764**
Functional balance (BBS)	14.22±5.30	14.45±5.66	0.894**
Frequency of fall	1.12±1.40	0.77±1.44	0.435**

Data expressed in means ± SD
 *Significant
 **Non- Significant

Table 3. Variance between the initial and final reading for Timed “Up & Go” Test (TUGT), Berg Balance Scale (BBS) and frequency of fall in exercises and control group.

Outcome	Exercise group n=21	Control Group n=20	P-value
Functional mobility (TUGT)	-2.67±3.12	+3.26±2.33	0.0001*
Functional balance (BBS)	4.45±6.07	-1.11±3.98	0.001*
Frequency of fall	-0.89 ±2.16	+1.02±0.82	0.001*

Data expressed in means ± SD
 *Significant
 **Non- Significant

When comparing the base line data and the final data for exercise and control group, where the functional mobility was measured (TUGT) there was an high significant difference seen for interventional group vs control group (-2.67±3.12 vs +3.26±2.33 P < 0.0001), likewise when comparing the exercise group and control group for Functional balance (BBS) there was a significant difference seen in between group (4.45±6.07vs -1.11±3.98, P < 0.001) proving improvement in the ability to distribute body weight without a fall.

With improvement seen in the functional mobility and functional balance there was also an significant difference seen with reduction in the frequency of fall in between groups (-0.89 ±2.16 vs +1.02±0.82, P < 0.001) resulting that patient when performed exercises for the given duration improved on the checked parameters.

In the past decades studies have been performed for balance and exercises training in osteoporotic patients. The current study was performed for osteoporotic patients for 6 month duration, improving upon the functional balance and functional mobility and reducing the frequency of fall of individual after intervention of exercises. The increases in the functional mobility was seen in patient undergone exercise protocol and was evaluated with time up and go test, comparable results were seen in studies performed by Asmidawati et al., (2014), where home exercise program was performed by patient and resulted in improvement in turning and mobility performance in elderly, with the study the author demonstrated that patient who participated in study especially intervention group showed better result as compared to control group. Balance training program includes mainly aerobic, strengthening and flexibility exercises (Seco et al., 2013), it is difficult to isolate the effectiveness of different types of exercises performed together balance training (Orr et al., 2008), but is has been seen with exercises performed regularly produces

positive result and benefit in term reducing the risk of fall, (Kuptniratsaikul et al., 2011).

The present findings recommend that balance training and exercises produces more evident results than that of strengthening exercises the outcome was reduction in timing of TUGT in subjects performing exercises. The results are significant as related studies shows increase in the risk of fall with conceded mobility (Davis et al, 2010). The mobility and balance is one of the significant constituent of routine activities (Rosenberg et al., 2011). With regular training and improved balance plays an important role in reduction of risk of fall, few studies reveals relationship of exercise training in prevention of fall at older adults, but some studies claims regular activities reduction in frequency of fall (Ambrose et al., 2019), similar studies suggest the characteristic of exercises and intensity of exercise performed on regular interval yields significant results (Gschwind Y.J et al., 2013) Regular exercises and observance towards daily routine can improve the fundamental parameters of balance and mobility, (Osho O et al., 2018).

Adherence of the exercise can also be improved in a home based with certain instruction through a manual or a diary, telephonic reminder & one to one session with physiotherapist to learn and perform correct form of exercises. The environment plays an important role for developing interest towards the exercises also , physical and psychological support from family have proved beneficial results, the results from the present study reveal the benefit of exercises and its relationship with functional mobility, functional balance and frequency of fall in the interventional group.

CONCLUSION

The adapted system of exercises for elderly obese and osteoporotic patients under supervision of physiotherapist which were followed by home based exercise protocol and regular telephonic follow-up proved to improve on functional mobility, functional balance and reduce frequency of fall.

REFERENCES

- Ambrose TL, Davis J C, Best J R, Dian L, Madden K , Cook W, Hsu C L, Khan KM. (2019) Effect of a Home-Based Exercise Program on Subsequent Falls Among Community-Dwelling High-Risk Older Adults After a Fall. *The Journal of the American Medical Association*; Vol 321 No.21: Pages 2092. <https://doi.org/10.1001/jama.2019.5795>
- Asmidawati A, Hamid T.A, Hussain R.M, Hill K.D (2014) Home based exercise to improve turning and mobility performance among community dwelling older adults: protocol for a randomized controlled trial. *BioMed Central Geriatrics*; Vol.14 No.100: Pages 1-9.<https://doi.org/10.1186/1471-2318-14-100>
- Benedetti MG, Furlini G, Zati A, and Mauro GL (2018) The Effectiveness of Physical Exercise on Bone Density in Osteoporotic Patients *BioMed Research International Vol.*, Art. ID 4840531, Pages 1-10. <https://doi.org/10.1155/2018/4840531>
- Davis J, Robertson M, Ashe M, Liu-Ambrose T, Khan K.M, Marra C.A, (2010) Does a home-based strength and balance programme in people aged > or = 80 years provide the best value for money to prevent falls? A systematic review of economic evaluations of falls prevention interventions,” *British Journal of Sports Medicine*, Vol. 44, No. 2: Pages 80–89. <https://doi.org/10.1136/bjsm.2008.060988>
- Denova-Gutiérrez E , Méndez-Sánchez L, Muñoz-Aguirre P, Tucker K.L, Clark P (2018) Dietary Patterns, Bone Mineral Density, and Risk of Fractures: A Systematic Review and Meta-Analysis. *Nutrients*; Vol.10 No. 1922: Pages 1-29.<https://doi.org/10.3390/nu10121922>
- Gschwind YJ1, Kressig RW, Lacroix A, Muehlbauer T, Pfenniger B, Granacher U. (2013) A best practice fall prevention exercise program to improve balance, strength / power, and psychosocial health in older adults: study protocol for a randomized controlled trial. *BioMed Central Geriatrics Vol13 No.105 Pages 1-13.*<https://doi.org/10.1186/1471-2318-13-105>
- Chahal, A., N Malhotra (2018) Screening in healthy individuals for risk of falls by employing various tools: A clinical study. *Bioscience biotechnology research communications ;Vol.11 No.2:Pages 224-230*
- Chahal A, Multani N.K, Rao H.K 2016) Impact of Therapeutic Interventions in Patients of Osteoporosis *Indian Journal of Physiotherapy and Occupational Therapy-An International Journal*; Vol.10 No.2: Pages 61-65 <https://doi.org/10.5958/0973-5674.2016.00049.6>
- Howe TE, Rochester L, Neil F, Skelton DA, Ballinger C. (2011) Exercise for improving balance in older people. *Vol 9No.11 CD004963.* <https://doi.org/10.1002/14651858.CD004963.pub3>
- Kuptniratsaikul V, Praditsuwan R ,Assantachai P, Ployetch T, Dompunturak S.U, Pooliam J() Effectiveness of simple balancing training program in elderly patients with history of frequent falls. *Clinical intervention in aging*; Vol 6: Pages 111-7. <https://doi.org/10.2147/CIA.S17851>
- Lima C.A, Ricci N.A, Nogueira E.C, Ferracini M.R, (2018) The Berg Balance Scale as a clinical screening tool to predict fall risk in older adults: a systematic review. *Physiotherapy*; Vol.104 No.4: Pages 383-394. <https://doi.org/10.1016/j.physio.2018.02.002>
- Marcucci G, Brandi M.L (2015) Rare causes of osteoporosis. *Clinical Cases in Mineral and Bone Metabolism*; Vol. 12 No.2: Pages 151-156. <https://doi.org/10.11138/ccmbm/2015.12.2.151>
- Multani N.K, Chahal A (2010) A study of risk factors: Comparison between osteoporosis and osteopenia in the district of Patiala; *Journal of Exercise Science and Physiotherapy Volume 6 No.1:Pages 50-56*

- Multani N.K., Kaur H, Chahal A (2011) Impact of Sporting activities on Bone mineral density. *Journal of Exercise Science and Physiotherapy*; Vol 7 No. 2: Pages 103-109 <https://doi.org/10.18376//2011/v7i2/67615>
- Malhotra N, Chahal A (2018) The effectiveness of pelvic floor exercises on symptoms in females with stress urinary incontinence. *Bioscience biotechnology Research Communications*; Vol. 11 No. 4: Pages 681-686 <https://doi.org/10.21786/bbrc/11.4/19>
- Orr R, Raymond J, Singh M.F (2008) Efficacy of Progressive Resistance Training on Balance Performance in Older Adults A Systematic Review of Randomized Controlled Trials. *Sports Medicine*; Vol.38 No.4: 317-343. <https://doi.org/10.2165/00007256-200838040-00004>
- Osho O, Owocyte O, Armijo-Olivo S. J *Aging Phys Act.* (2018). Adherence and Attrition in Fall Prevention Exercise Programs for Community-Dwelling Older Adults: A Systematic Review and Meta-Analysis. *Journal of aging and physical activity*; Vol.26 No.2 : Pages 304-326. <https://doi.org/10.1123/japa.2016-0326>
- Ozcan A , Donat H, Gelecek N, Ozdirenc M, Karadibak D (2005) The relationship between risk factors for falling and the quality of life in older adults. *BioMed Central Public health*; Vol 5 No.90: Pages 1-6. <https://doi.org/10.1186/1471-2458-5-90>
- Prato I S.C.F , Maffei de AndradeII S, Cabrera M.A.S, Dip R.M, Geremias dos Santos H, Dellaroza MSG, MesasA.E (2017) Frequency and factors associated with falls in adults aged 55 years or more. *Journal of Public Health* ;Vol.51 No. 37: Pages 1-10. <https://doi.org/10.1590/s1518-8787.2017051005409>
- Rosenberg D E, Bombardier C H, Hoffman J M, Belza B (2011) Physical Activity Among Persons Aging with Mobility Disabilities: Shaping a Research Agenda *Journal of Aging Research* Vol. Art.ID 708510: Pages 1-16. <https://doi.org/10.4061/2011/708510>
- SecoJ , Abecia LC, Echevarría E, Barbero I, Torres-Unda J , Rodriguez V, Calvo J.I (2013) A long-term physical activity training program increases strength and flexibility, and improves balance in older adults,: Vol.38, No.1 Pages 37-47 <https://doi.org/10.1002/rnj.64>
- Senderovich H, Tang H, Belmont S (2017) The Role of Exercises in Osteoporotic Fracture Prevention and Current Care Gaps. Where Are We Now? Recent Updates. *Rambam Maimonides Medical Journal*; Vol. 8 No. 3:e0032, Pages 1-14. <https://doi.org/10.5041/RMMJ.10308>