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Comparison of peer group based intervention versus family group based intervention in initial two stages of management of childhood obesity amongst school going adolescents

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Abstract
A comparison of peer and family group based two stage intervention regarding management of childhood obesity is done among obese adolescents. Total 200 obese adolescents, comprising 105 males and 95 females (age 10-19 years) are studied. 100 underwent Family based counseling (Group A) and 100 to Peer based counseling (Group B). Adolescents showed improvement in health behaviors after counseling are subjected to additional 3 months of Stage 1 intervention whereas adolescents showed no improvement in health behaviors are shifted to Stage 2 intervention. At stage 1intervention, decrease in mean weight was 0.77 kg in Group A(N=100) and 0.62 kg in Group B(N=100), while decrease in mean BMI was 0.29 kg/m^2 and 0.24 kg/m^2 in Group A and B respectively. In Group A, only 50% adolescents showed decrease in weight and BMI, as compared to 37% in Group B at Stage I. Remaining 50% from Group A and 63% from Group B were shifted to Stage 2. At the end of 6 month stage 1, mean BMI reduction was 0.96 kg/m^2 in group A and 0.75 kg/m^2 in group B. Mean weight reduction was 2.58 kg in group A and 2.24 kg in group B. At stage 2, mean weight reduction was 1.46kg and 1.05kg in group A and B whereas mean BMI reduction was 0.55kg/m^2 and 0.43kg/m^2 in group A and B. Both Peer and family group based interventions showed good effect. Whereas family based interventions proved more beneficial in comparison to peer group interventions.

Keywords: Adolescents, obesity, peer group, family group, intervention

Introduction
Adolescent obesity is a major public health concern in both developed and developing countries associated with many health problems. There is a significant increase in adolescent obesity in India in which Jammu and Kashmir stands at 17th position (Sahu and Prashar, 2016) [1]. In the present study, comparison of peer and family group based two stage intervention regarding management of childhood obesity has been done to improve healthy behaviour of adolescents having obesity.

Material and methods
The present interventional study was conducted on school going obese adolescents (10- 19 years) who were selected from four private higher secondary schools in the vicinity of SMGS hospital in Jammu region over a period of one year. After seeking approval from Institutional Ethical Committee, Govt. Medical College Jammu, the school authorities were approached. Height (m^2) was measured by using stadiometer. IAP growth charts revised in 2015 was used to classify obesity where in BMI ≥ 27 was taken as a risk factor for obesity. BMI was assessed by formula Weight (kg)/Height (m^2). All those children who were having ≥ 27 BMI were selected and Informed consent of the parents of eligible children and those who are willing to participate was taken and rest of students were excluded whose age was below or above 10-19y with BMI ≤ 27. Baseline investigations were conducted at the beginning of the study in SMGS Hospital for both groups. Obese adolescents whose parents were available and willing to accompany them to SMGS hospital for counselling constituted the Family group (Group A).

And whose families were unable to come to SMGS hospital were included in Peer group (Group). Subjects were selected during first 4 months of study and 100 subjects were enrolled in each group. The adolescents were managed as per the strategies detailed below;

Stage 1 i.e: Prevention Plus Protocol includes: eat five or more servings of fruits and vegetables daily, Use television and computer for not more than 2hours / day, Participate in at least 60 minute of moderate to vigorous physical activity / day, Limiting consumption of sugar sweetened beverages and meals outside the home.

Stage 2 i.e: Structured Weight-Management Protocol includes: develop a low energy dense, balanced macronutrient diet plan, Increased structured daily meals and snacks, Schedule supervised physical activity for at least 60 minute/ day, Limit television and computer use to < 1hour/day.

In present study, stage 1and stage 2 that are purely counselling based were used. The Group A underwent counselling in SMGS Hospital for 1hour every month while the Group B was counselled in the school premises along with the Peers in a cohort of not > 5 in number for 1hour every month. BMI was recorded monthly and eating behaviour was recorded as per the Performa. If there is improvement in BMI and eating behaviour after 3 month, stage 1 treatment was continued for next 3 month. In subjects where no significant improvement in BMI took place after 3 month, stage 2 was considered. BMI was taken after 6 month and if there was no improvement in BMI after 6 month of counselling, tertiary care intervention was advised.

Statistical analysis

The data was analyzed with the help of computer software MS Excel and SPSS. The data was presented as mean ± SD/SEM. t- test and One Way Analysis of Variance (ANOVA) was used to assess statistical significance. "p" value of <0.05 was considered statistically significant.

Results

This study was conducted on 200 obese adolescents (100 were enrolled in each group including family and peer group). Stage-based management protocol was used. Following observations were done during the course of the study:

Table 1: Findings related to Baseline characteristics

Variables		Group A (N=100)			Group B (N=100)		
		Frequency	**Percentage**	**Mean± Sd (Range)**	**Frequency**	**Percentage**	**Mean±Sd (Range)**
Age				15.99±1.32			16.03±1.31
Gender	Male	50	50%		55	55%	
	female	50	50%		45	45%	
Weight (kg)	< 70	11	11%	79.68±7.53 (64-98)	11	11%	80.4±7.37 (65-99)
	70-75	23	23%		15	15%	
	75-80	66	66%		74	74%	
BMI (KG/M^2)	27.00-27.99	28	28%	29.27±1.96 (27.02-36.79)	20	20%	29.48±1.81 (27.02-36.79)
	28.00-28.99	27	27%		24	24%	
	29.00-29.99	16	16%		22	22%	
	≥30.00	29	29%		34	34%	

Mean age ± standard deviation was 15.99± 1.32y in Group A and 16.03± 1.31y in group B. Mean age± standard deviation of male adolescents (n=105) was 15.67±1.25y, while that of female adolescents (n=95) was 16.37±1.28y. Mean (range) weight of group A was 79.68 kg and 80.4kg was of group B. Mean (range) BMI of group A was 29.27kg/m^2, while that of group B was 29.48 kg/m^2.

Table 2: Group comparison of mean baseline characteristics including laboratory investigations

Variables		Group A	Group B	p-value
Male, %		50	55	
Female,%		50	45	
Mean age (years)		15.99 ± 1.32	16.03 ± 1.31	p=0.83*
Mean Weight (kg)		79.68 ± 7.53	80.4 ± 7.37	p=0.53*
Mean BMI (kg/m^2)		29.27 ± 1.96	29.48 ± 1.81	p=0.53*
Means of Laboratory investigations	TC (mg/dL)	146.77 ± 19.25	141.62 ± 20.13	t=1.84; p=0.06*
	LDL-C (mg/dL)	94.13 ± 11.76	94.23 ± 10.66	t=-0.06; p=0.95*
	HDL-C (mg/dL)	58.88 ± 2.26	59.87 ± 2.50	t=-2.93; p=0.004**
	TG (mg/dL)	73.16 ± 10.54	72.07 ± 9.14	t=0.78; p=0.43*
	RBG (mg/dL)	97.35 ± 18.60	103.92 ± 19.62	t=-2.43; p=0.01**
	HbA1c (%)	4.85 ± 0.36	4.81 ± 0.44	t=0.66; p=0.50*
	SBP (mmHg)	119.77 ± 6.87	120.97 ± 5.35	t=-1.37; p=0.17*
	DBP (mmHg)	74.18 ± 4.32	74.77 ± 4.02	t=-0.99; p=0.31*

Mean high density lipoprotein cholesterol and random blood glucose was significantly more in Group B subjects as compared to Group A subjects (p=0.003 and p=0.01 respectively).

Table 3: Two stage interventional management protocol

Stage 1 Management Protocol	Group a (N=100) No. (%)	Group b (N=100) No. (%)
Five or more servings of fruits and vegetables daily	24 (24.00)	21 (21.00)
Limit screen time to 2 hours or less per day	27 (27.00)	25 (25.00)
One hour moderate physical activity every day	16 (16.00)	11 (11.00)
Refraining from consumption of all sugary drinks	23 (23.00)	19 (19.00)
Stage 2 Management Protocol	**N= 50**	**N=63**
Low energy dense, balanced macronutrient diet plan	9(18.00)	6(9.52)
Structured daily meals / snacks	15(30.00)	12(19.05)
Physical activity for 1 hour/ day	28(46.00)	30(47.62)
Limit screening time to less than 1 hour/ day	32(64.00)	26(41.27)

At stage 1 interventional management protocol, 32 adolescents from Group A and 29 from Group B followed all the components of Stage 1 management protocol whereas 10 and 24 adolescents from group A and group B did not showed any compliance. At stage 2 interventional protocol, 38 (76%) adolescents and in Group B, 37 (58.73%) adolescents followed one or other Stage 2 management protocol.

Table 4: Overall comparison of mean weight and BMI between the two groups at stage 1 management protocol

Variable		Group A	Group B	Statstical Interference (T- Test)	Stastical interference (One- Way Annova)	
					Group A	Group B
At enrolment (n=100)	Mean weight(kg)	79.68±7.53	80.4±7.37	P=0.53*		
	Mean BMI(kg/m^2)	29.27±1.96	29.48±1.81	P=0.53*		
At stage 1 intervention (n=100)	Mean weight (kg)	78.91±7.49	79.78±7.44	t=0.82,p=0.41**	F=1.20;p=0.30**	F=0.64;p=0.52**
	Mean BMI (kg/m^2)	28.98±2.04	29.24±1.89	t=0.93;p=0.35**	F=6.09;p=0.002**	F=2.57;p=0.08**
At 3 M	Mean weight(kg)	78.58±8.32 (n=50)	78.72±8.45 (n=37)	t=0.62;p=0.53**	F=1.20;p=0.30**	F=0.64;p=0.52**
	Mean BMI(kg/m^2)	28.25±1.40 (n=50)	28.81±1.40 (n=37)	t=1.84;p=0.06**	F=6.09;p=0.002**	F=2.57;p=0.08**
At 3M follow up of stage 1 intervention	Mean weight(kg)	77.3±8.33 (n=50)	77.54±8.56 (n=37)	t=0.13;p=0.89**	F=1.20;p=0.30**	F=0.64;p=0.52**
	Mean BMI(kg/m^2)	27.79±1.40 (n=50)	28.37±1.48 (n=37)	t=1.86;p=0.06**	F=6.09;p=0.002**	F=2.57;p=0.08**

*- significant, **- not significant

At 3 months of Stage 1, decrease in mean weight was 0.77 kg in Group A and 0.62 kg in Group B, while decrease in mean BMI was 0.29 kg/m^2 and 0.24 kg/m^2 in Group A and Group B. In Group A, 50% adolescents showed relevant decrease in weight and BMI, while in Group B, 37% showed decrease in weight and BMI at 3 months of Stage 1. These adolescents were followed up for additional 3 months of Stage 1 intervention, while remaining 50% adolescents from Group A and 63% from Group B were shifted to Stage 2 intervention.

On comparing the weights after 3 months of stage 1 intervention and after another 3 months of follow-up of stage 1, reduction in weight was more in Group A (1.28 kg) as compared to that of Group B (1.18 kg).

Table 5: Overall comparison of mean weight and BMI between the two groups at stage 2 management protocol

Mean Weight			Mean BMI	
Time interval	Group A	Group B	Group A	Group B
At stage 2 intervention	78.68±6.42	80.76±6.71	29.51±2.39	29.67±1.98
After 3 months	77.22±6.47	79.71±6.64	28.96±2.42	29.24±2.00
Statistical interference (t- test)	t=1.13;p=0.26**	t= 0.88;p=0.37**	t=1.14;p=0.25**	t=1.21;p=0.22**

*- significant, **- not significant

At the end of Stage 2 intervention, mean reduction was 0.43 kg/m^2. Findings also reveal that the reduction in mean BMI at 3 months was more in Group A as compared to Group B which indicates the good effectiveness of two stage intervention.

Discussion

The present study was undertaken to manage childhood obesity through family and peer-based intervention protocol. Stage 1 management protocol was followed for 6 months by50% adolescents in Group A and 37% from Group B and Stage 2 intervention by 50% adolescents of Group A and 63% of Group B (n=63), balanced macronutrient diet plan was followed by 18% and 9.52% adolescents, structured daily meals/snacks by 30% and 19.05%, physical activity for 1 hour/daily by 46% and 47.62% and screen time to <1 hour/day by 64% and 41.27% adolescents. In Group A, 38 adolescents and in Group B, 37 adolescents followed one or other Stage 2 management protocol. This response was reflected by overall mean reduction of weight and BMI in both the groups.

Kameswararao and Bachu (2009) reported 0.33% reduction in obesity, 27.5% reduction in sweets, chocolates and carbohydrates rich food consumption, 17% reduction in sedentary activities, and 19% reduction in prolonged TV watching in a school – based intervention study [2]. This is in agreement with our study.

At 3 months of Stage 1, decrease in mean weight was 0.77 kg in Group A and 0.62 kg in Group B, while decrease in mean BMI was 0.29 kg/m^2 and 0.24 kg/m^2 in Group A and Group B. After 3 months of follow-up of Stage 1, reduction in weight and BMI was more in Group A (1.28 kg and 0.96 kg/m^2) as compared to Group B (1.18 kg and 0.44 kg/m^2).

At Stage 2 intervention (3 months), mean weight of Group A (n=50) was 77.22 kg and of Group B (n=63) was 79.71 kg. Mean BMI of Group A was 28.96kg/m^2 and 29.24 kg/m^2 of group B. In partial agreement with our study, Munsch *et al.* [3] (2008) and Boutelle *et al.* [4] (2011) found small

difference in reduction of weight or BMI percentile of family and peer group.

In the present study, within group, mean reduction in weight of Group A (n=50) was 2.58 kg and 2.24 kg in group B(N=37). Group reduction of mean weight of Group A was more as compared to Group B. Mean reduction in BMI of Group A was 0.96 kg/m^2 and 0.75 kg/m^2 of group B. Similar to our study, Golan *et al*. (1998) showed a significant decrease in percent overweight and BMI over 12 month [5].

At Stage 2 intervention, mean weight reduction in Group A (n=50) is 1.46 kg, while in Group B (n=63) is 1.05 kg. Mean weight reduction at 3 months was more in Group A as compared to Group B. Mean reduction in BMI from baseline in Group A (n=50) was 0.55 kg/m^2 and in Group B (n=63) was 0.43 kg/m^2. Reduction in mean BMI at 3 months was more in Group A as compared to Group B.

Similar to our study, Golan and Crow (2004) in a 7-year study reported a significant mean reduction in overweight among family-focused group compared with peer-focused group [6].

In the present study, mean reduction in weight and BMI at both Stage 1 and Stage 2 interventions was more in family-based Group A as compared to peer-based Group B. Thus, we can safely say that intervention yielded positive results

Conclusion

The following conclusions was drawn from the study that the mean reduction in weight and BMI at stage 1 and stage 2 intervention was more in family group (A) as compared to peer group (B).

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