

Efficacy of Innovative Smart Phone App in Influencing the Life Style of Adults with Metabolic Syndrome-Observational Case Control Study

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Abstract

Background: Changing habits and dietary pattern of 21st century has led to increase incidence of lifestyle disorders. Digitalization has both beneficial and deleterious influence on every aspect of our life like mobile phones on health. This study has been done to study the efficacy of mobile phone applications in improving the life style of adults with metabolic syndrome.

Methodology: Sixty subjects aged 40-60 years who have access to mobile phone with any two criteria of metabolic syndrome NCEP ACP III criteria were recruited to two groups.(App messgaes alert and control). Mobile phone App (MGM Smart) was installed in the volunteers' mobile phone which gives reminder for walking, records the duration, provides feedback and saves the data for analysis. The duration of walking of controls were followed by message/calls. After recording study parameters (weight, Blood Pressure and quality of life) the subjects were followed for a period of 1 month and the parameters were recorded. The pre post interventional parameters were compared and analysis done to derive at any significant difference. Comparison of the post interventional data between the two groups by independent t test ($p < 0.05$)

Results: The duration of walking had increased significantly with the usage of app. Weight, DBP remain the same in both groups. Systolic blood pressure of the group A was significantly less than that of the controls. The quality of life is also greater by 24% in the cases. It is observed that there was no significant difference in weight, diastolic BP after the study period in both groups. The mean SBP, reduced, quality of life bettered in group A.

Conclusion: Significant reduction in the SBP, increase in duration of walking, QOL has occurred for subjects who had access to MGM Smart App.

Keywords: Metabolic syndrome, mobile, applications, lifestyle.

Introduction

Sedentary lifestyle and unhealthy dietary habits of the 21st century have disturbed the normal metabolism of human compromising health and wellness. Metabolic syndrome is one amongst the many aftermath of modernization.¹ Metabolic syndrome refers to the co-occurrence of cardiovascular risk factors, insulin resistance, obesity, atherogenic dyslipidemia and

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hypertension^[2,3]. It is closely linked with obesity and lack of physical activity^[4]. Age standardized prevalence rate of metabolic syndrome is 33.5%, 24.9% in male and 42.3% in female^[5]. In this era of digitalization the advancements of information and technology have done revolutionaries in every aspect of our lives, one such gadget is smart phone. A mobile app is a computer program designed to run on a mobile device such as phone/tablet or watch^[6]. It has innumerable operations in the healthcare systems which medical professionals have started to become aware of. The healthcare apps are developed for diverse uses such as diagnosis, follow up of patients, obtaining demographic survey etc. There are few health apps like **medscape**, **skyscape** which are validated after clinical trials^[7]. It is well known that the progression of metabolic syndrome can be reduced by adapting healthy lifestyle habits. The mobile apps can be utilized to motivate the subjects to adopt such changes be periodic reminders/feedback^[8]. An attempt has been made to study the effectiveness of one such newly developed mobile app in augmenting the adherence of healthy lifestyle changes of adults with metabolic syndrome.

Methodology

Study Design: Observational case control study

Study Population: 60 executives of government organization who have access to android phones, grouped equally into group A (interventional group) and group B (control)

Inclusion Criteria: Subjects of age 40-60 years with any two positive features of metabolic syndrome according to the NCEP ACP III criteria.^[9]

Exclusion Criteria: Subjects with endocrine disorders, acutely ill patients.

Duration of Study: One month.

Study was conducted in a semi urban town of south India after obtaining approval of the Institutional Human ethics committee (Ethical clearance reference-ICMR-ST/2018/06/04) between August 2018 and September 2018. Basic awareness on metabolic syndrome, its consequences and the benefits of lifestyle changes such as exercise, dietary modifications were given to the recruited subjects. They were given a briefing on the study plan and informed consent obtained from them. Subjects who volunteered to use the mobile App (MGM

Smart) were grouped as A and others were included as control. During recruitment, weight, blood pressure were recorded and their quality of life was assessed by validated questionnaire (Respondent Self-Report version) (Q-LES-Q-SF)^[9]. An innovative computer application “MGM Smart” was developed with help of software experts, which monitors and send feedback on the duration of walking of the user. MGM Smart App has two different modules. i.e., User app and Admin dashboard. User app is the android mobile application where the users have to register/signup (Figure 1) with their personal details. After signing up, users have to login with their user-id and password for giving daily response. The personal details like name, e-mail-ID, height, weight, blood pressure, glucose level, have to be furnished in the corresponding screen. Specific walking time which the user prefers has to be provided as the default walking time according to preference by the user in the screen intended for the same. The default time is changeable by the user. Every day notification will pop up in their android device to remind user for walk.

After walking the user has to enter the duration of their activity. App provides immediate feedback on the quality of walk, as “Good, can do better etc.”. Once the process is completed the App comes to the home screen and notification will be shown for the next day. The user can check their performance of the whole week from the weekly report page.

Admin dashboard is the module desktop where the administrator will receive all the details of the user and their walking activities. All details received from the user will be stored in the database which can be downloaded for analysis by the admin.

The e-health app (MGM Smart) was installed in the mobile phones of subjects belonging to Group A. They received sufficient training on usage of the App. Their walking habit was monitored feedback provided immediately. Whereas the controls were periodically (weekly) contacted to gather information about their exact walking duration. After a period of one month, weight and blood pressure were recorded and their Quality of life was assessed for all subjects. The duration of walking for Group A was retrieved from the stored data of the App, whereas that of control group was gathered daily by contacting them via messages/call.

Assessment Parameters:

1. Weight (kgs)

2. Blood pressure (mm Hg)
3. Quality of life
4. Duration of brisk walking

Statistical Analysis: Comparison of pre and post interventional data of the two groups were done by paired t-test (significance, $p < 0.05$). Comparison of the post interventional data between the two groups by independent t test ($p < 0.05$).



Figure 1. Home page of MGM Smart app

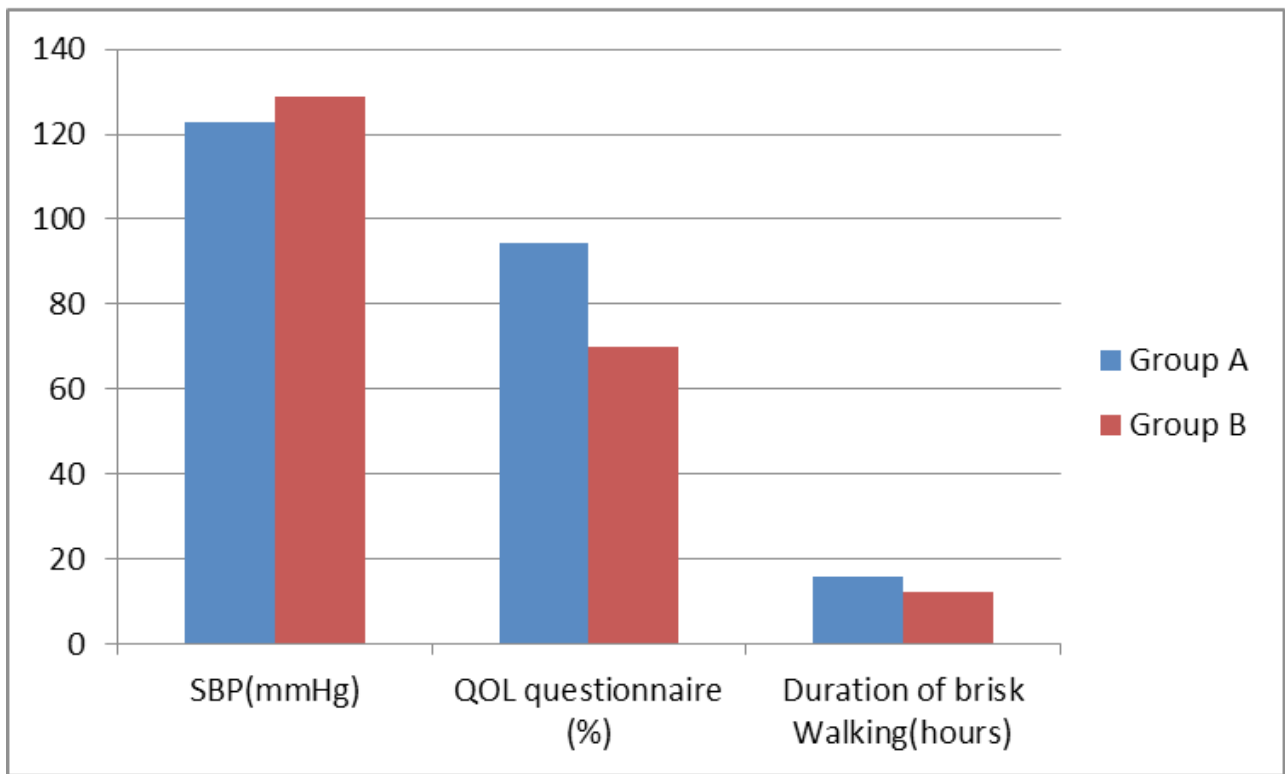


Figure 2: Showing the comparison of both the groups over outcome variables.

Table 1: Comparison of pre and post interventional data of Group A

S.No.	Parameter	Pre-intervention		Post-intervention		p value
		Mean	Std. deviation	Mean	Std. deviation	
1	Weight (kg)	70.77	11.428	70.433	11.6639	.746
2	SBP (mmHg)	133.17	10.326	122.70	9.041	.041
3	DBP (mmHg)	84.93	6.097	83.60	4.994	.812
4	QOL	73.26	10.49	94.43	8.79	.002

* p value < 0.05 is significant

Table 2: Comparison of pre and postinterventional data of Group B

S.No.	Parameter	Pre-intervention		Post-intervention		p Value
		Mean	Std. deviation	Mean	Std. deviation	
1	Weight (kg)	70.83	11.647	69.617	12.638	.191
2	SBP(mmHg)	130.53	14.450	128.67	10.223	.255
3	DBP(mmHg)	83.67	6.082	82.57	6.235	.312
4	QOL	69.23	10.23	69.96	9.44	.684

* p value < 0.05 is significant

SBP-Systolic blood pressure mm Hg, DBP-Diastolic blood pressure mm Hg, QOL-Quality of life

Table 3: Comparison between the pre-interventional data of the control and case group

S. No.	Parameter	Control		Case		P Value
		Mean	Std. Deviation	Mean	Std. Deviation	
1	Weight (kg)	70.77	11.43	70.83	11.65	0.98
2	SBP(mmHg)	133.17	10.33	130.53	14.45	0.42
3	DBP(mmHg)	84.93	6.10	83.67	6.08	0.42
4	QOL questionnaire (%)	73.26	10.49	69.23	10.23	0.14

* p value < 0.05 is significant

SBP-Systolic blood pressure mm Hg, DBP-Diastolic blood pressure mmHg, QOL-Quality of life

Table 4: Comparison of the post-interventional data between the groups

S.No.	Parameter	Case		Control		P Value
		Mean	Std. Deviation	Mean	Std. Deviation	
1	Weight (kg)	70.43	11.66	69.62	12.64	0.80
2	SBP(mmHg)	122.70	9.04	128.67	10.22	0.01
3	DBP(mmHg)	83.60	4.99	82.57	6.23	0.48
4	QOL questionnaire (%)	94.43	8.79	69.96	9.44	0.05
5	Duration of brisk Walking (minutes)	952.33	642.05	740.00	414.34	0.01

* p value < 0.05 is significant

SBP-Systolic blood pressure mm Hg, DBP-Diastolic blood pressure mm Hg, QOL-Quality of life

Results

Comparison of physiological parameters and QOL, within the groups before and after study period was performed by paired t test and comparison between the groups done by independent t test. It was observed that there was no significant difference in weight, diastolic BP after the study period. The mean of Systolic Blood pressure (SBP), 133.17mmHg has reduced to 126.70mm Hg after the intervention. (Table 1)Quality of life which was 73% during the pre-interventional period has

significantly increased to 94%. On analyzing the above data, it was obvious that significant alteration in the SBP and QOL has occurred for subjects who had access to MGM Smart App (Table 2) (Group B)

It was evident from the Table 2 that the differences between all the pre and post interventional values are negligible. Hence we infer that no significant improvement in the quality of life and other physiological parameters had occurred in group B after the study period.

Comparison of physiological parameters and QOL, between the groups before and after study period was performed by independent t test.

Table 3 provides the comparative results of the pre-interventional data of the control and case group. Before intervention the mean weight of the both the groups were almost the same. The mean of the systolic blood pressure of the control group before intervention is 133.17 mmHg and that of case group is 130.53 mmHg and the p value is insignificant. Likewise, diastolic blood pressure also remains almost same in both the populations. From the above findings, it is clear that the subjects are appropriately matched before grouping.

Comparisons of the post-interventional data's were performed to analyze the influence of the App. The duration of walking during the entire period had increased significantly with the usage of app. Weight, DBP remain the same in both groups. Systolic blood pressure of the group A is 6mmHg less than that of the controls with significant p value ($p = 0.01$) The duration of walking has significantly increased by 210 minutes. The quality of life is also greater by 24% in the cases.

Discussion

Digitalization has become the way of our life in this era. The electronic gadgets are like double edged sword with both merits and demerits. Their usage has considerable influence in every walk of our life. Biotechnologist and healthcare professionals collaborate to meticulously explore the ways for beneficial utilization of digital technology in enhancing healthcare services. Mobile technology on smartphones and tablets allow health care providers access to clinical information at the point of care [10]. Majority of smart phone users belong to the economically stable, executives who are more prone to suffer from metabolic syndrome. Hence the study was designed to analyze the influence of mobile app in promoting healthy lifestyle behaviors. It could record a significant improvement in the health status by reduction in SBP, improved QOL and increased duration of walking. Earlier few studies had researched the outcome of health applications in diverse setup. Kenneth D Mandl documents after the observational study on SMART platform that smartphone applications can bring down healthcare costs by support standard evolution accommodate differences in care work flow, foster competition in the market and accelerate innovation [11].

Zhao J, Freeman B researched the influence of mobile phone app on health behaviors state that there is improvement in adherence to healthy habits by the smart phone users provided they are monitored with regular reminders.[12].

Similar research to find out the efficacy of smartphone apps in managing the dietary habits of people had reported that there is no much change in the calorie intake and weight of the person using it but it was found to be useful for the physician to follow up and calculate the approximate calorie intake of the patients[13].

For the management of diabetes 12 apps were studied and out of them only 5 apps were associated with clinically significant improvements. None of the studies showed patient improvements in quality of life, blood pressure, weight, or body mass index[14] which is contrary to our result obtained in this study. Similarly the result of the aforementioned clinical trial ENGAGED which aimed at obesity intervention with smartphone phone application also concludes that self-motivation is the only thing needed to improve life style and improve health whether the person uses an application for it or with paper [15]. Thus, smartphone applications influence or motivate people to lead a better and healthy life style during the interventional period of one month. There are many limitations in introducing health care apps among people because most people feel it as a burden to use these mobile apps regularly and enter their data into it. Apps don't help in motivating people to lead a healthy life style like brisk walking daily. It can just help people who are already motivated to do brisk walking by supporting them.

Conclusion

From our study we could conclude that the MGM smart app for monitoring metabolic syndrome is efficient in getting desirable response from willing participants. Significant health improvement as observed by augmented duration of brisk walk leading to improved quality of life and reduction in SBP of the App user is observed. Long term follow up/usage of app is expected to validate the efficacy of the health App. Motivation and willingness among people is required for greater benefits. Future studies can be conducted on the benefits of long term usage of the App in diverse settings and clinical conditions.

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Conflict of Interest of each Author: Nil

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