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Impact of Web-based Physical Therapy on Chronic Mechanical Neck Pain in Sedentary Female Office Workers

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Abstract: ***Background****: Neck pain is a frequent complaint, more so in women than in men. Web-based messages have positive effects and are well received. Because of the increasing number of internet users, researchers and health providers focused on internet technology to encourage health behavior change. Objective: This study was done to detect the effect of 4-weeks of Web-based involvement on chronic mechanical neck pain (CMNP) in sedentary female office workers.*
Materials and Methods*: A total of 28 sedentary female office workers with CMNP were recruited, screened and participated in the study. Their age ranged from 30-40 years. They were randomized into an experimental and control groups and assessed at pretest and after 4 weeks. After rating neck pain, range of motion and muscle strength for both groups. Both groups underwent strengthening and stretching neck exercises. In addition, the experimental group received website messages program to keep up an educational program in the areas of stretching, strengthening, videos, animations, power points, articles, daily announcements and information for improving workplace ergonomics.*
Results*: There was a substantial improvement in neck pain, range of motion (ROM), muscle strength and daily living activates (ADL) in both groups, a substantial decrease in sedentary behavior in experimental group and there were no significant changes in most of the investigated parameters in the control group (P <0.05). Conclusion: These results suggest that Web-based messages has the potential to improve CMNP of sedentary female office workers. More research is needed to confirm the study results.*
Key Word*: Web-based physical therapy, chronic mechanical neck pain (CMNP), sedentary office workers.*

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I. Introduction

Neck pain is a widespread problem, especially for those who work usually on computer (Sihawong, R., et al., 2011). Approximately forty-three to sixty-nine of office workers have neck pain (Paksaichol, A., et al., 2012), more so in women than in men and causes impairment of quality of work, disability and affecting the whole life (Sabeen, F., et al., 2013). Non-specific neck pain is pain on cervical area with radiation or not, without any specific disease (Paksaichol, A., et al., 2012).

Office work and neck pain have a significant relationship. The personnel who spend a great time on computer will take a forward head posture (upper cervical extension and flexion of lower cervical), this variation in the cervical region can result in musculoskeletal dysfunction such as (upper crossed syndrome) caused by keeping poor head position for an extended duration of time. Forward head posture will cause pain in cervical and shoulder region and reduces the amount of joint sense, causing abnormal proprioception and poor postural balance (Lee, M. Y., Lee, H. Y., & Yong, M. S., 2014).

The internet now became a primary source for health information. Around 34% of the world's population uses the internet (Dobson, F., et al., 2014). Because of the increasing number of internet users, researchers and health providers focused on internet technology to encourage health behavior change. Prior research has identified that Web-based messages are doing well in improving physical activity behavior in healthy adults. The benefit of using internet are obtainable 24 hours for each day and commonly accessible (Bossen, D.,et al, 2014).

Aim of this study: To evaluate the effect of Web-based messages on CMNP. This study was done to evaluate the efficacy of 4-weeks of internet intervention to help sedentary female workers to adopt and maintain neck muscle exercise program and relieve neck pain.

Office Workers and CMNP: Neck pain is extremely frequent between office workers; sedentary lifestyle office-based workplaces and an increasing dependence on technology have amplified the incidence of neck pain recently (Yang, H., et al., 2015). Diverse epidemiological studies in working populations show a high percentage of neck and shoulder pain and complaints between office workers (Falla, D., et al., 2013). Physical and psychosocial work-related risk factors, for example, sedentary work for long period in computer workers

and administrators has been showed as a risk factor for neck pain (Hubbard, B., & Gorman, K. 2008). Additional study showed a relationship between work-related injuries and working for longtime. The relationship is to some degree multifaceted, the prevalence of neck pain increased always with every set of working hours over the typical 40-hour workweek. This array is consistent with a dose-response association. Two probable mechanisms might make clear why extended working hours were connected with CMNP might consist of extended period of experiencing physical and psychosocial risk and inadequate recovery time (Catenacci, V., et al., 2014).

The etiology of CMNP between computer office workers is multifaceted and inadequately well-defined. Recently a number of studies have identified the potential risk factors for CMNP, for example static body postures, repeated tasks and workroom design. Moreover, psychosocial factors for example high repetitive work demands, little self-rule and limited peer backing. Upper extremity musculoskeletal complaints between computer office workers are linked with both work-associated psychosocial and physical factors (Alipour, A., et al., 2008).

CMNP and Exercise: Active exercise is preferred to focus on the muscles that could be injured; subsequent strains and tears of the stabilizing tissues (deep muscles and ligaments) may lead to dysfunctional movement due to deficiencies in motor control and dysfunctional movement as a result of imperfect motor control at the cervical spine. Superficial neck musculatures substitute movements of deeper muscles, causing quick fatigue, over activity, and pain; thus, active exercises could be effective for rehabilitating injured musculoskeletal structures and improve motion (Ma, C., et al., 2011). Stretching, strengthening, and aerobic exercise have the greatest positive effects on isometric strength, moderating pain and disability by having a global rise in well-being (O'Riordan, C., et al., 2014).

Web-based messages and Physical Activity: Physical activity (PA) promotes effective life span while decreasing the progress and development of limiting problems and chronic disease. Physical activity is related to reduced depression, increased intellectual well-being and lowered danger of functional decrease. An online physical activity plan has got the possibility to affect PA of inactive individuals theoretically. Stand-alone web-based exercise plan that tailors material based on users' choices and interests may improve self-reported PA and be effectively acquired by inactive older adults (Irvine, A. B., et al., 2013).

Web-based messages has been showed assurance in the promotion of physical activity behavior modification and offer evidence about the potency of web-based PA messages in people with chronic disease. Web-based messages have positive effect and were well received, and have the ability to increase the PA of sedentary individuals in worksites and elsewhere (Irvine, A. B., et al., 2011).

II. Material And Methods

Subjects: Thirty-two female office workers, with CMNP, their ages ranged from 30 to 40 years old, suffering from nonspecific pain for more than at least three months. They were medically checked to be free from any organic musculoskeletal neck pathology. Subjects were divided randomly into two groups. The first (experimental) (group A= 14) participated in a web-based treatment program consisted of exercise training and web-based messages, while the second group (B= 14) received the same exercises without visiting the web site, and considered as a control. Consent forms were signed by all.

Recruitment: All participants were recruited via a combination of online and offline recruitment schemes (e.g., flyers, newsletters and face to face), 32 individuals eventually were qualified for the research. It was randomized recruitment, i.e., recruitment was started before preparing the web-messages, with screened individuals requested to wait, and recruiting continued for 7 days following the T1 evaluation.

Study Design: The present study was a randomized controlled trial with a pretest (T1) and a post intervention at 4 weeks after (T2). After screening into the study, participants were split into two groups randomly: experimental (A) group, who used the internet website messages, and a control (B) group, who did not have access to the web-messages.

Material

Equipment: A goniometer (Jamar e-z read18, made in Ireland) is a tool that either measures an angle or permits an item to be rotated to an exact angular position (Tousignant, M., et al., 2000).

Tools: Neck pain and disability index (Vernon–minor):Participants were asked to fill a questionnaire that has been designed to provide information about the effect of neck pain on their ability to manage everyday life activities. It consists of nine sections (pain intensity, personal care, lifting, reading, headaches, concentration, work, sleeping, and recreation).

Pain analog scale:Participants were inquired to rate their pain on a scale from zero to ten (zero= no pain, ten = maximum pain) (Bijur, P. E., et al., 2001).

Method

Assessment: ROM: Assessing by using goniometer to evaluate range of motion on individual with CMNP was carried on (flexion =45°, extension =45°, lateral flexion (Rt) & (Lt) =45° and rotation (Rt) & (Lt) =60° (Swinkels, R. A., & Swinkels-Meewisse, I. E., 2014).
MMT: Manual muscle test was performed by the researcher to assess muscle strength of neck flexors, extensors, side bending & rotation (Cuthbert, S. C., & Goodheart, G. J., 2007).

Procedures: After completing random selection of groups, participants were emailed health information via the "healthy-us" messages. Experimental group members were asked by emails to periodically check the sent messages. One week after receiving "healthy-us" messages, an e-mail was sent informing them that the following session is available. The e-mail reminder messages continued weekly thereafter up until the 4th week. After submitting the pre-test (T1) assessment, all individuals that had finish four weeks, were emailed for the post-test (T2) date. Participants who didn't submit the T1 assessment or who discontinued participation were dropped out from the study. Experimental group participants were encouraged to carry on with the treatment until they had completed all sessions.

Treatment: Strengthening & Stretching Exercises for Neck Muscles: Upon participants' assessment, all participants started an exercise program (O'Riordan, C., et al., 2014).

Web-based Messaging Program: "Healthy-us" messages were designed and established by the researcher. It is a repeated health awareness messages to improve physical activity, functional ability and mobility of individuals with mechanical chronic neck pain. Using video and texts messages combined with goals for activities. It helped users to follow, along within exercise plan consisting of two activities: stretching and strengthening [Shoulder rolls, Arm and shoulder stretch, Head turns, Neck side stretch, Shoulder capsule stretch, Head forward and turn, Hands behind head, Shoulder shrugs, Shoulder blade Squeeze and Trapezius stretch] (Häkkinen, A., et al., 2007). All to be repeated daily as tolerated. Our rationale for an online exercise plan was based on a former research and a previous Web-based involvement for sedentary individuals (Catenacci, V., et al., 2014). The study contains exercises that participants can do independently and safely with minimal equipment. Messages were sent to improve subject's behavioral intention to be more active. At return visits, messages were sent to the users to encourage and support them to keep using the exercise plan.

Messages offered multiple ways to understand the impact of exercises on CMNP. As we designed the awareness messages for sedentary users, we anticipated that many would relate better to nontraditional videos models and to exercises related to gyms, neither specialized clothing, nor equipment. Other intervention (e.g., hot and ice applications) were presented as options, but were not highlighted in text or video presentations.

Video-based instructional material was clear on teaching details and active knowledge-building content. Printable text posts were prepared. Every exercise was presented with text instruction and video demonstration. If they certainly were not motivated, they were requested to change either the power or length of the exercise (e.g. decrease the amount of stretches; decrease minutes per day), and these were demanded until they have confidence that they will reach their weekly commitment.

Experimental group also were asked to print handout instructions. The printout included guidelines, next week's exercise plan, personal goals and safety methods for each activity type. To conclude, the session ended with a video listing the benefits of the exercise plan and encourage the user to comeback for the following session. Participants could see the sent awareness messages as frequently as they enjoyed (e.g. to read texts and articles, watch educational videos or download slides). At return visits, they were welcomed back and given video and text support. Depending on an interactive, self-report about achieving exercise commitments, users were encouraged to carry on their efforts. For individuals reporting no progress, messages were sent to them, boosting trying again. At every visit, the user was offered a video support on overcoming exercise barriers [e.g. too tired, lack of motivation, lack of skills, etc.] (Irvine, A. B., et al., 2011). Every week new informative data were accessible to boost understanding of making exercise as a habitual practice over time, depending on their self-reported progress and inspiration.

User Satisfaction: Individuals' approval of the web-based messages was calculated with reviews of observed satisfaction. Users replied to various items including satisfaction, simplicity, usefulness of the general data, helpfulness of the posts, and readiness to suggest the program to a friend. For every single object, individuals were requested to rate their thoughts on a 7-point ranking scale (1 "Not at all" to 7 "Extremely agree").

III. Result

The data obtained in the current study indicated that, there was a significant improvement in neck pain, range of motion, muscle strength and activities of daily living. In addition to a decrease in sedentary behavior in experimental group and there was no significant changes in most of the investigated parameters in the control group (P <0.05).

Table no 1: Mean values and significance of pain, muscle strength, ROM and ADL in group (A) before and after intervention.

Experimental	Mean ± SD		P-value
	Pre-treatment	Post-treatment	
Pain	5.2857	2.5	.000
Muscle strength			
Flexion	2.857	4.928	.000
Extension	3.5	4.928	.001
Side bending (Rt)	3.5	5	.001
Side bending (Lt)	3.928	5	.015
Rotation (Rt)	4.785	5.428	.022
Rotation (Lt)	4.285	5.428	.002
ROM			
Flexion	37.29	41.36	.000
Extension	39.57	42.57	.001
Side bending (Rt)	36.07	40.43	.000
Side bending (Lt)	37.14	39.93	.001
Rotation (Rt)	56.14	59.36	.002
Rotation(Lt)	55.57	57.0	.336
ADL			
Personal care	4.357	5	.000
Lifting	2.785	4.071	.001
Reading	4.142	4.5	.096
Headaches	4.285	4.857	.026
Concentration	4.714	4.928	.082
Work	3.928	4.714	.000
Sleeping	4.285	4.857	.014
Recreation	4	4.642	.000

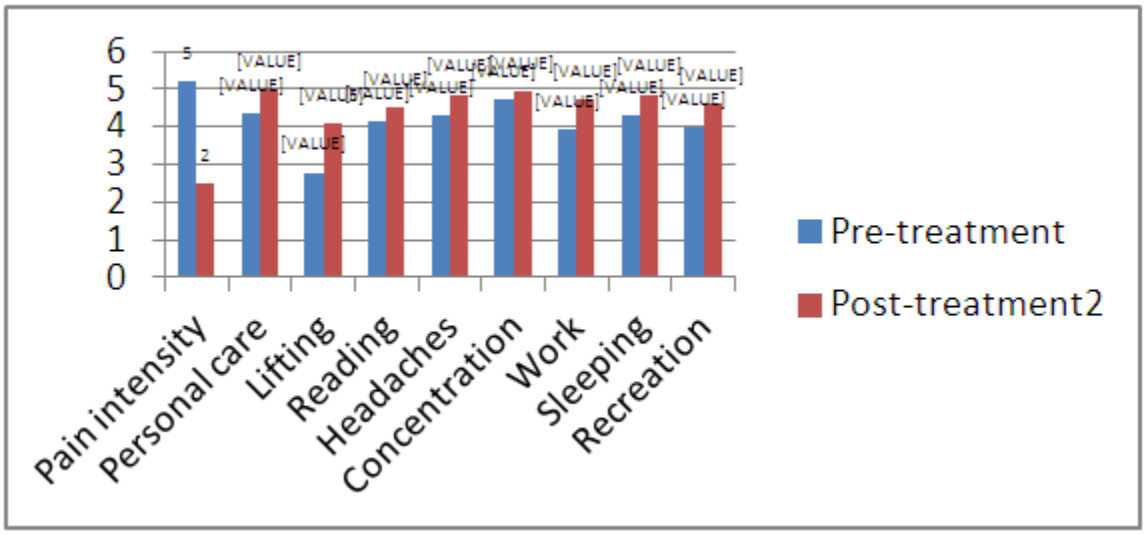

Fig. 1: Pre-treatment and Post-treatment results of Neck Pain and Disability Index (Experimental Group).

Table no2: Mean values and significance of pain, muscle strength, ROM and ADL in group (B) before and after intervention.

Control	Mean ± SD		P-value
	Pre-treatment	Post-treatment	
Pain	5.017	3.5	.000
MMT			
Flexion	3.5	5.14	.000
Extension	4.35	5.35	.005

Side bending (Rt)	4.57	4.92	.096
Side bending (Lt)	4.35	5.35	.013
Rotation (Rt)	4.64	5.21	.071
Rotation (Lt)	4.21	5.14	.006
ROM			
Flexion	38.57	39.86	.302
Extension	41.64	42.86	.166
Side bending (Rt)	41.50	42.36	.201
Side bending (Lt)	41.57	41.86	.818
Rotation (Rt)	58.57	57.36	.417
Rotation (Lt)	59.21	59.07	.793
ADL			
Personal care	4.357	4.857	.003
Lifting	2.714	4.285	.001
Reading	4.142	4.785	.057
Headaches	4.214	4.714	.013
Concentration	4.571	4.785	.189
Work	3.928	4.428	.029
Sleeping	4.5	4.357	.686
Recreation	3.928	4.571	.057

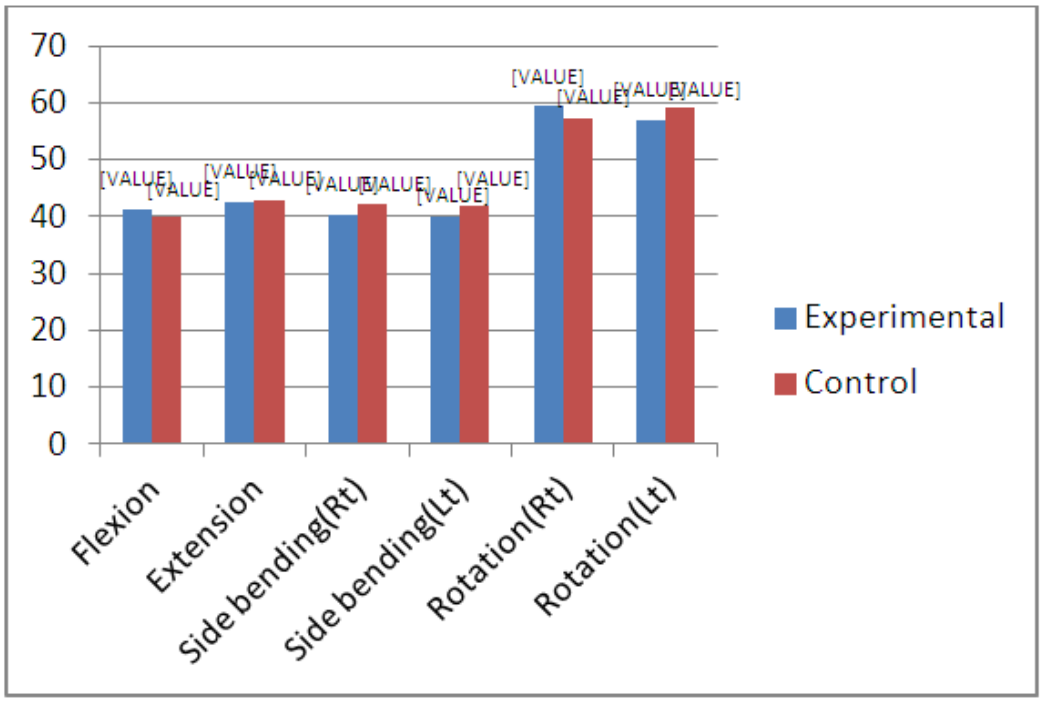

Fig. 2. Post-treatment Results of ROM (Experimental & Control Groups).

Table no3: Mean values of pain, muscle strength, ROM and ADL in group (A) and group (B) after intervention.

Group	Mean ± SD Experimental	Mean ± SD Control	P-value
Pain	2.5	3.4	.467
MMT			
Flexion	4.928	5.14	.594
Extension	4.928	5.35	.286
Side bending (Rt)	5	4.92	.904
Side bending (Lt)	5	5.35	.530
Rotation (Rt)	5.428	5.21	.574
Rotation (Lt)	5.428	5.14	.430
ROM			
Flexion	41.36	39.86	.542
Extension	42.57	42.86	.788

Side bending (Rt)	40.43	42.36	.427
Side bending (Lt)	39.93	41.86	.459
Rotation (Rt)	59.36	57.36	.267
Rotation (Lt)	57.0	59.07	.204
ADL			
Personal care	5	4.857	.153
Lifting	4.071	4.285	.149
Reading	4.5	4.785	.231
Headaches	4.857	4.714	.516
Concentration	4.928	4.785	.410
Work	4.714	4.428	.192
Sleeping	4.857	4.357	.277
Recreation	4.642	4.571	.712

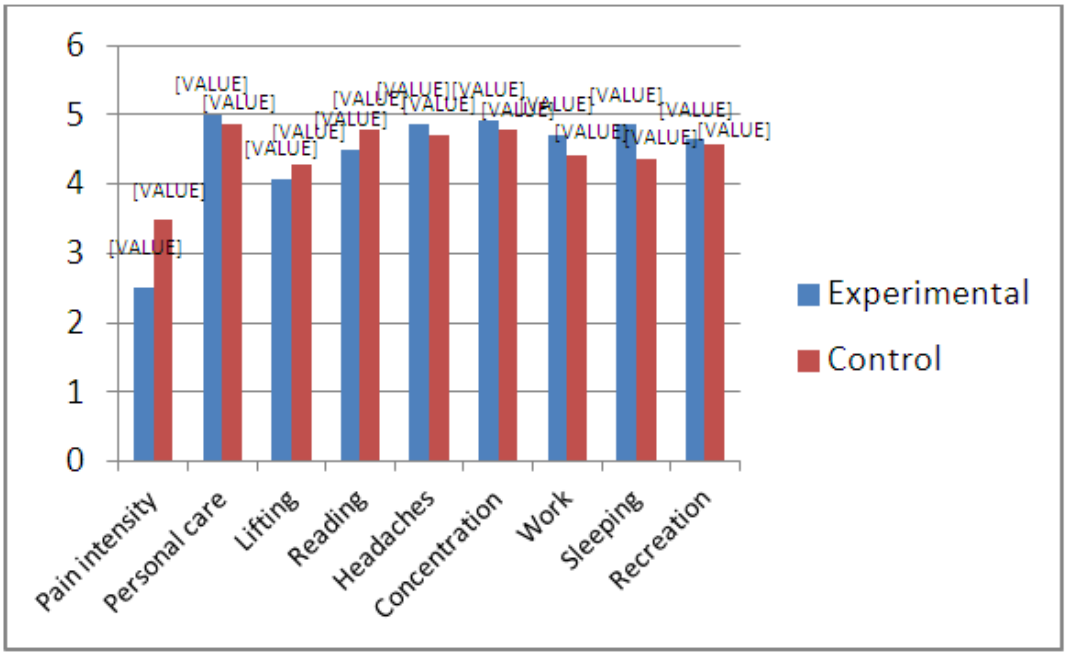

Fig. 3. Post-treatment Results of Neck Pain and Disability Index (Experimental & Control Groups).

IV. Discussion

This study was an attempt to investigate the effect of Web-based messages on mechanical neck pain in sedentary female workers. The outcomes of this study indicated that there was a substantial improvement in neck pain in the experimental group. In addition, there was a substantial decrease in sedentary behavior. The changes in the control group weren't significant in most results. However, there wasn't significant difference between both groups.The results of healthy-us web messages indicates that the intervention positively impacted on neck pain in sedentary female workers, and it was well received.The hypothesis was that the intervention would have a positive effect on neck pain and functional act in sedentary workers.Participants who have been late completing courses or had stopped taking them were confronted with relatively less of the intervention prior to the T2 assessment. Additionally, the control group results mostly improved with time, showing that the assessment process have caused reactive effects. Being confronted with those questions could have alerted the control group to enhance their interaction.

The fact that 28 of the 34 participants who accomplished visit 1 finished all 4 weeks, implies that the web-based messages was engaging enough for a most of individuals to follow along with over all 4 weeks. This can be a very optimistic sign, but we did not find any attrition comes from similar web research by which to measure our results (Jancey, J., et al., 2007). As shown by the dose-response analysis, greater program utilization resulted in good alternation in results, which were stated by others (Danaher, B. G., & Seeley, J. R., 2009), although not totally for all those internet physical activity studies. However, knowing the dose response connection between enhances the outcomes and program commitment is intricate by individual's attrition

(Hubbard, B., & Gorman, K., 2008). The participants who dropped from the study have less information about the advantages of the exercise, and they had barriers to exercise. Whereas the outcomes displaced here must be looked at carefully until confirmed by other research, they could give a clue to the reasons why sedentary individuals does not succeed to begin to contribute in an exercise program.

Other research connect participants' behavior to their unrealistic expectation, demographics, and physical characteristics (Toelle, T. R., et al., 2019), low intention, time necessities, and various barriers to exercise (Mohammed, M., & Naji, F. L., 2017). Christensen and colleagues, reported that individuals who complete a program may misperceive the dose-response relationship, which also could be linked to individual incentive or program commitment. Additional research is obviously needed to study the effectiveness of diverse intervention components on engagement and effectiveness with web-based intervention, which could improve methods to enhance outcomes and reduce attrition (Maikovich-Fong, A. K. (Ed.), 2019).

V. Conclusion

Despite limitations, this research demonstrates that Web-based involvement program had been well received by sedentary female workers. This sort of intervention could be offered to users all the time on the Internet, which makes it a potentially cost-effective exercise tool that could reach many people. The outcomes are impressive given that the research wasn't conducted for a bigger sample, which could have provided additional support and encouragement for the individuals and could have decreased attrition. Still, more research is necessary to understand factors related to using Internet interventions to keep engagement in exercises over time.

Recommendations

The results of this study considered the following recommendations:

1- Using the exercise program combined with web-based intervention to reduce CMNP.
2- Including all the governorates of Saudi Arabia in research study.

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Authors' contributions

Dr.Salwa Elgendy came up with the study idea, with the responsibility in protocol drafting, reference search, data collection and data analysis, writing, revising and final proof of the manuscript.Dr. Mohamed Elbanna participated in data collection, editing, revising and statistical analysis of data.

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Conflict of interest: None

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