IN THE NAME OF ALLAH,
THE MOST GRACIOUS,
THE MOST MERCIFUL
# AUMJ EDITORIAL BOARD AND DESCRIPTION

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4. While insuring integrity and declaration of any conflict of interest, AUMJ is adopting an unbiased, fast, and comprehensively constructive one-month peer review cycle from date of submission to notification of final acceptance.

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Protective Effect of Diphenyl Dimethyl Bicarboxylate and Water Orange Peel Extract Against Monosodium Glutamate-Induced Hepatotoxicity in Mice: A Histological and Toxicological Study

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Abstract

Background: Monosodium L-glutamate (MSG), one of the most abundant naturally occurring amino acids, is frequently added as a flavor enhancer to food products. MSG is known to have some adverse effects in humans and experimental animals.

Objectives: To investigate the protective effect of co-administration of either Diphenyl Dimethyl Bicarboxylate (DDB) or water orange peel extract (OPE) on the structural and biochemical changes of the liver induced by MSG in male mice.

Materials and Methods: After one-week adaptation period, forty-eight healthy male mice, aging ~2 months with a body weight (bw) of 27.50 ± 3.08 gm, were randomly divided into six equal groups to be treated as detailed for 6 weeks. Group I served as untreated normal controls. DDB Group II was treated orally with DDB (300 mg/kg bw) once daily. OPE Group III was treated orally with OPE (200 mg/kg bw) once daily. MSG Group IV was treated orally with MSG 97 mg/kg bw once daily. DDB-MSG cotreatment Group V was treated with both DDB and MSG at the same dosage route, and frequency. OPE-MSG cotreatment Group VI was treated with both OPE and MSG at the same dosage, route, and frequency. Body weight, liver weight, liver functions (serum albumin, total bilirubin, AST, and ALT) and hepatic oxidative stress (lipid peroxidation and superoxide dismutase and catalase activities) markers and the hepatic histological changes were evaluated.

Results: Serum AST, ALT, bilirubin and hepatic lipid peroxidation were significantly increased in Group IV mice, while the serum albumin and hepatic superoxide dismutase and catalase activities were significantly decreased. Histologically, central veins were congested, and hepatocytes showed diffuse degeneration, necrosis and increased glycogen granules and collagen fibers deposition. The liver function and histology were normal among mice of Groups V & VI associating significant reduction in lipid peroxidation and increased antioxidant enzyme activities, in addition to the improvement of the hepatocellular changes.

Conclusion: The dietary supplementation with either the antioxidant DDB or OPE has an almost equipotent protective effect against MSG-induced hepatotoxicity.

Keywords: Monosodium glutamate-induced hepatotoxicity, Diphenyl dimethyl bicarboxylate, Orange peel extract; Monosodium glutamate, Oxidative stress, Hepatotoxicity, Histology.

**Introduction**

Monosodium L-glutamate (MSG), chemically known as 2-amino pentane dioic or 2-amino glutaric acid, is commonly used in traditional food as a flavor-enhancing ingredient. MSG is one of the major numerous naturally occurring amino acids that contain 78% of glutamic acid, 22% of sodium and water. The safety of MSG’s usage has generated much controversy locally and globally\(^1\). MSG is known to have some adverse effects in humans and experimental animals. It produces many symptoms as headache, dizziness, numbness, flushing weakness, and sweating and also increases of the brain oxidative stress\(^2\).

These include the Chinese restaurant syndrome, neuro-excitotoxicity\(^3,4\), and obesity\(^5\). The utilization of MSG as a flavoring agent was queried because of its hazards, but in numerous places, there are no restrictions on the amount of MSG that can be combined with food. Therefore, the population ingests huge amount of MSG that elevates the glutamate level in the blood\(^6\).

Chronic administration of MSG induces oxidative stress in hepatic and cardiac tissues of experimental animals due to metabolic shifting\(^7\-9\). Increased oxidative stress brings change in the membrane lipids and proteins, which could be responsible for the initiation of metabolic disorders. Oxidative stress is a biochemical disequilibrium occurring due to excessive production of free radicals and reactive oxygen species, which aggravates oxidative damage to biomolecules that cannot be counteracted by antioxidative defense systems\(^10\,11\).

Previous experimental researches had demonstrated that the intake of MSG causes injury to the nerve cells of hypothalamus\(^12\). Also, MSG causes changes in mitochondrial lipid peroxidation (LPO) and antioxidant state of the liver.

Herbs had an important role in prevention and treatment of several diseases. During the previous years, scientific studies and public media essay on side effects of such the agent have elevated the concern in natural materials by the general population\(^13\). Many researchers had reported the anti-inflammatory and antioxidant effects of some plants extract which protect the organs in various animal models\(^14,15\). Although some information are available on the MSG-induced oxidative stress and toxicity, the studies on the effect of antioxidants, especially those consumed in food, on MSG-induced toxicity and oxidative stress are lacking. Moreover, most of studies, so far on MSG, have been carried out on very high doses (≥4 mg/g). Therefore, there is requirement to confirm whether MSG induces oxidative stress at an perceivable lower dose and assess the influence of nourishment of antioxidants on it\(^16\).

Diphenyl dimethyl bicarboxylate (DDB) has been utilized as a therapeutic material for patients with acute or chronic viral hepatitis\(^17,18\). It is a synthetic derivative of schisandrin C, which is present as a component of Fructus schizandraceae. Many studies had reported the protective effects of DDB against numerous hepatic toxicants\(^17,19\). Recently, Helal et al reported the hepatoprotective effect of DDB in animals and human\(^20\). Citrus fruits exhibit important bioactivities, including antioxidant, anti-inflammatory, anti-obesity, anti-cardiovascular and antitumor abilities\(^21\-24\). DDB and orange peel have been shown to possess antioxidant activity in different experimental animal models\(^25\).

To date, the hepatoprotective effect of each of DDB and OPE in MSG-hepatotoxicity model was not reported. Therefore, we planned this study to investigate the effect of co-administration of MSG and each of DDB and OPE on specific makers of liver function, oxidative stress and hepatocellular injury in mice.

**Materials and Methods**

**Chemicals and Assay Kits:** MSG was obtained from ALPHA CHEMICA (Mumbai, India), DDB (the Yellow Pill) was obtained from Guang Zhou Xing Qun Pharmaceutical Company (Guangzhou, China). It was ground as powder form, and then was suspended in water just prior to administration. The water OPE was prepared from pulverized dried clean orange peels (50 °C) after extraction in

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**Notes:**

boiling water (100 g/L) with stirring for 40 min. The clear extract was filtered and freeze-dried. The dehydrated powder was reconstituted in water (so as its dose is 200 mg/kg bw of mice) as crude water extracts of orange peels. All other high reagent grade chemicals and diagnostic kits were obtained from Sigma-Aldrich (St. Louis, MO, USA). Using specific commercially available kits, lipid peroxidation measured as malondialdehyde (MDA; catalog No. MAK085), superoxide dismutase (SOD) activity (Catalog No. SOD19160), and catalase activity (Catalog No. CAT100) were measured.

**Animals and treatment schedule:** Forty-eight healthy Albino male mice, ~2 months age, weighing 20-30 gm (27.50 ± 3.08) used in this study were bred at the animal house of our College of Medicine, where the investigations were carried out after being ethically approved by the local Bioethical Committee. Mice were housed in standard plastic cages at 22 ± 2 °C, 55% humidity, and 12/12 h light-dark cycle with ad libitum of standard chow and drinking water. After one-week adaptation period, mice were randomly divided into six equal groups: Control Group I received no treatment, DDB Group II was treated orally with DDB (300 mg/kg bw) once daily(26), OPE Group III was treated orally with OPE (200 mg/kg bw) once daily(27), MSG Group IV was treated orally with MSG (97 mg/kg bw, it is prepared in water at 0.64 g/L) once daily(28), DDB-MSG cotreatment Group V was cotreated with DDB + MSG, and, OPE-MSG cotreatment Group VI was cotreated with OPE + MSG at the same dosage and schedule for 6 weeks. Animals were weighed once weekly and at the end of the experiment.

**Sampling and investigations:** Morning blood samples from overnight fasting mice were collected from orbital venous plexuses under light diethyl ether anesthesia before sacrifice by cervical dislocation. Serum was recovered from clotted blood by centrifugation at 1000 xg for 10 min at 4 °C and was aliquot frozen at ~80 °C till usage. The liver was rapidly dissected out, weighed and prepared for homogenization and histological assessment.

Serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) were determined in U/L by the method of Reitman and Frankel(29). Albumin (g/dL) was determined by the method of Pinnel and Northam(30). Total bilirubin level in mg/dL were measured based on the method of Perry et al(31).

**Hepatic homogenate preparation:** One gram of hepatic tissues was homogenized in 9 mL ice cold phosphate-buffered saline (pH 7.5), centrifuged for 15 minutes at 3000 rpm and 4 °C, and, the clear supernatant was stored in aliquots – 80 °C for further utilization(32). Relative body weight (RBW) was calculated as: (final body weight / initial body weight) x 100 and, relative liver weight (RLW) was calculated as: (liver weight / final body weight) x 100. **Hepatic MDA and antioxidant enzyme activities estimation:** Hepatic homogenate level of MDA was estimated as thiobarbituric acid reactive substance according to Kei technique(33). Hepatic homogenate activity of SOD was estimated according to Minami and Yoshikawa(34) technique. The method of Aebi(35) was used to determine the hepatic catalase activity in tissue homogenates. These are the biochemical bases for the utilized commercial assay kits.

**Histological examination:** 10% buffered formalin was used for fixation of the liver specimens for 24 h, and standard dehydration was done in ascending grades of ethyl alcohol. Liver tissue samples were then cleared in xylene and embedded in paraffin-wax. Sections (5 μm thick) were cut by a microtome and stained with each of hematoxylin and eosin (H&E), Masson trichrome and periodic acid Schiff (PAS) reaction. The sections were then examined and microphotographed(36).

**Statistical analysis:** Statistical analysis was done using SPSS software, version 22 for windows (SPSS, Inc., Chicago, IL, USA). Numerical data obtained from the experiment were expressed as mean ± SD. After ascertaining the homogeneity of variance between treatment groups, one-way analysis of variance (ANOVA) followed by Student-Newman-Keuls test
were performed. Our significance was set at p value of <0.05.

Results

Effect of the different treatments on body and liver weights of mice (Table 1):
The relative body weights (RBW) were significantly decreased upon administered MSG compared to normal groups I, II and III (p <0.05), with nonsignificant differences amongst the three of them. Co-administration of either of the protective agents in groups V and VI caused significant increases in RBW compared to MSG mice, but not compared to each other. Because of inflammatory, edema and degenerative changes, relative liver weight (RLW) was significantly increased in MSG mice compared to the three normal animal groups (p <0.05), with nonsignificant differences amongst the three of them. Each of the two protective agents significantly normalized RLW compared to MSG mice (p <0.05), with nonsignificant differences amongst the two of them.

Table 1: Effects of six weeks of cotreatment with monosodium glutamate (MSG) and either diphenyl dimethyl bicarboxylate (DDB) or water orange peel extract (OPE) on relative body (RBW) and liver (RLW) weights of mice. Data are mean ± SD. n = 8 mice for each group.

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<th>OPE-GIII</th>
<th>MSG-GIV</th>
<th>MSG-DDB-GV</th>
<th>MSG-OPE-GVI</th>
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<td>RBW</td>
<td>118.43 ± 9.53</td>
<td>116.48 ± 11.45</td>
<td>120.91 ± 16.33</td>
<td>94.02 ± 7.82abc</td>
<td>117.33 ± 12.29d</td>
<td>115.29 ± 9.54d</td>
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<td>RLW</td>
<td>4.91 ± 0.75</td>
<td>4.62 ± 0.30</td>
<td>4.68 ± 0.44</td>
<td>4.49 ± 0.42abc</td>
<td>4.96 ± 0.49d</td>
<td>4.78 ± 0.50d</td>
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</table>

NCs-GI = Normal Control mice, DDB-GII = Mice treated with DDB, OPE-GIII = Mice treated with OPE, MSG-GIV = Mice treated with the hepatotoxin MSG, MSG-DDB-GV = Mice cotreated with MSG + DDB, and, MSG-OPE-GVI = Mice cotreated with MSG + OPE. RBW = Relative body weight and RLW = Relative liver weight. Significance of p value is <0.05 comparing; a = vs. GI, b = vs. GII, c = vs. GIII, and, d = vs. GIV mice.

Effect of different treatments on serum liver function parameters in mice (Table 2):
MSG administration significantly increased serum ALT, AST and total bilirubin and significantly decreased serum albumin compared to the three groups of normal mice; I, II and III (p <0.05), with nonsignificant differences amongst the three of them. Cotreatment with either DDB or OPE in groups V and VI significantly improved these liver function parameters but they remained significantly higher than the three control groups of mice (p <0.05).

Table 2: Effects of six weeks of cotreatment with monosodium glutamate (MSG) and either diphenyl dimethyl bicarboxylate (DDB) or water orange peel extract (OPE) on serum liver function biomarkers of mice. Data are mean ± SD. n = 8 mice for each group.

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<th>Parameters</th>
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<th>OPE- GIII</th>
<th>MSG-GIV</th>
<th>MSG-DDB- GV</th>
<th>MSG-OPE- GVI</th>
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<tr>
<td>ALT (U/L)</td>
<td>28.2 ± 5.3</td>
<td>27.2 ± 1.9</td>
<td>25.4 ± 4.8</td>
<td>94.2 ± 4.5abc</td>
<td>72.0 ± 5.05abcd</td>
<td>68.0 ± 3.9abcd</td>
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<tr>
<td>AST (U/L)</td>
<td>31.4 ± 4.5</td>
<td>28.40 ± 2.64</td>
<td>27.65 ± 5.31</td>
<td>98.83 ± 2.33abc</td>
<td>76.83 ± 5.2abcd</td>
<td>58.50 ± 3.9abcd</td>
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<td>Bilirubin (mg/dL)</td>
<td>0.3 ± 0.02</td>
<td>0.24 ± 0.03</td>
<td>0.26 ± 0.02</td>
<td>0.83 ± 0.07abc</td>
<td>0.62 ± 0.07abcd</td>
<td>0.49 ± 0.09abcd</td>
</tr>
<tr>
<td>Albumin (g/dL)</td>
<td>4.3 ± 0.3</td>
<td>4.17 ± 0.43</td>
<td>4.47 ± 0.45</td>
<td>2.77 ± 0.39abc</td>
<td>3.07 ± 0.1abcd</td>
<td>3.35 ± 0.52abcd</td>
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ALT = Alanine transaminase, AST = Aspartate transaminase. Other abbreviations and meaning of the significance of differences is same as Table 1.

Effect of different treatments on hepatic oxidative stress biomarkers in mice (Table 3):
The hepatic tissue levels of antioxidant markers (catalase and SOD) significantly decreased in upon MSG treatment.
compared to the normal three animal groups I, II and III. Tissue MDA content significantly increased compared to those groups ($p < 0.05$). The three normal animal groups I, II and III did not have significant differences amongst each other for catalase, SOD and MDA. Co-administration of each of the hepatoprotective agents, DDB or OPE, significantly improved levels of these markers compared to MSG group IV mice ($p < 0.05$) that, albeit, remained significantly different from the level in the three normal control groups. The two cotreatments did not have significant differences.

Table 3: Effects of six weeks of cotreatment with monosodium glutamate (MSG) and either diphenyl dimethyl bicarboxylate (DDB) or water orange peel extract (OPE) on hepatic oxidative stress markers in mice. Data are mean ± SD. $n = 8$ mice for each group.

<table>
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<th>OPE-GIII</th>
<th>MSG-GIV</th>
<th>MSG-DDB-GV</th>
<th>MSG-OPE-GVI</th>
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<tr>
<td>CAT</td>
<td>347.33 ± 21.76</td>
<td>348.16 ± 21.18</td>
<td>352.0 ± 16.49</td>
<td>208.33 ± 14.09&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>294.0 ± 18.51&lt;sup&gt;abcd&lt;/sup&gt;</td>
<td>297.83 ± 16.85&lt;sup&gt;abcd&lt;/sup&gt;</td>
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<tr>
<td>SOD</td>
<td>292.0 ± 4.04</td>
<td>294.0 ± 7.61</td>
<td>298.33 ± 3.26</td>
<td>227.16 ± 7.35&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>259.5 ± 5.64&lt;sup&gt;abcd&lt;/sup&gt;</td>
<td>264.33 ± 5.24&lt;sup&gt;abcd&lt;/sup&gt;</td>
</tr>
<tr>
<td>MDA</td>
<td>47.16 ± 4.26</td>
<td>45.50 ± 3.39</td>
<td>43.33 ± 2.16</td>
<td>86.16 ± 2.63&lt;sup&gt;abc&lt;/sup&gt;</td>
<td>70.66 ± 3.07&lt;sup&gt;abcd&lt;/sup&gt;</td>
<td>67.50 ± 2.88&lt;sup&gt;abcd&lt;/sup&gt;</td>
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CAT = Catalase (U/gm tissue), SOD = Superoxide dismutase (U/gm tissue), and, MDA = Malondialdehyde (mM/gm tissue). Other abbreviations and meaning of the significance of differences is same as Table 1.

**Liver Histological Changes:**

Light microscopic examination liver sections of groups I, DDB group II and OPE group III mice revealed almost the same histological architecture of the normal liver. H&E stained sections from control mice showed cords of hepatocytes radiating from the central veins and separated by radially arranged blood sinusoids with the hepatocytes having round vesicular nuclei and some of them appeared binucleated (Figure 1A). On the opposite hand, liver sections of MSG Group IV mice showed congestion of central veins with diffuse ballooning degeneration of hepatocytes (Figure 1B). Extensive hepatic degenerative changes and necrosis were noticed (Figure 1C). Diffuse hydropic and ballooning degeneration of hepatocytes with pyknosis and karyolysis of some nuclei and inflammatory cellular aggregation in the portal area were seen (Figure 1D), besides congested portal vein (Figure 1E). Liver sections from the cotreatment DDB-MSG-groups V and OPE-MSG-group VI showed improvement in the microscopic features of the hepatic architecture which were almost similar to those of the control group. Sections from DDB-MSG mice showed only mild vacuolar degeneration of some hepatocytes and pyknosis of nuclei of few hepatic cells (Figure 1F) and sections from OPE-MSG mice showed mild vacuolar degeneration of some hepatocytes (Figure 1G).

PAS stained section of normal control mice showed positive granules in the cytoplasm of most of the hepatocytes were detected in liver sections of normal mice (Figure 2A). However, liver section from MSG-treated mice showed marked increase in the total amount of PAS positive material as compared to controls (Figure 2B). Sections from the cotreatment mice; DDB-MSG and OPE-MSG, showed slight increase in glycogen content in the hepatocytes (Figures 2C&D).

Masson's trichrome stains collagen fibers greenish blue. Liver sections from normal control mice showed a normal distribution of collagen, as small amount of collagen fibers around the central veins with minimal collagen fibrils among hepatic cords (Figure 3A). Liver sections from MSG-treated animals showed increased deposition of collagen fibers especially in and around the portal areas (Figure 3B). Liver sections from the cotreatment animals showed an improvement in the collagen deposition as compared to liver of the experimental group (Figures 3C&D).
Figure 1: Histological changes in the liver of the study mice (H&E, X400). A) Liver of normal control mice showing normal architecture of the classic hepatic lobule. The hepatocytes with round vesicular nuclei (some of them appear binucleated) form cords radiating from the central vein and separated by radially arranged blood sinusoids. B) Liver of MSG-treated mice showing congestion of central vein with diffuse ballooning degeneration of hepatocytes (arrows). C) Liver of MSG-treated mice showing extensive hepatic degenerative changes with necrosis of some hepatocytes (arrows). D) Liver of MSG-treated mice showing diffuse hydropic and ballooning degeneration of hepatocytes with pyknosis and karyolysis of some nuclei and inflammatory cellular aggregation in the portal area. E) Liver of MSG-treated mice showing congested portal vein and some hepatocytes show vacuolar degeneration and pyknosis of their nuclei. F and G) Liver of DDP-MSG and OPE-MSG cotreated mice showing mild vacuolar degeneration of some hepatocytes and pyknosis of nuclei of few hepatic cells.
Figure 2: Histochemical changes in the liver of the study mice (PAS, X 400). A) Liver of normal control mice showing positive granules in the cytoplasm of most of hepatocytes. Nuclei of hepatocytes and cells lining sinusoids are counter stained with hematoxylin. B) Liver of MSG-treated mice showing marked increase of glycogen granules in the hepatocytes and dilatation of central vein. C) and D) Liver of each of DDP-MSG and OPE-MSG cotreated mice showing some increase of glycogen granules in the hepatocytes.

Figure 3: Histochemical changes in the liver of the study mice (Masson’s trichrome; X 400). A) Liver of normal control mice showing little collagen fibers around the central vein with minimal collagen fibrils among hepatic cords. B) Liver of MSG-treated mice showing excessive collagen fibers in and around the portal area. C) Liver of DDP-MSG cotreatment mice showing mild increase of collagen fibers around the portal area with minimal collagen fibrils among hepatic cords. D) Liver of OPE-MSG cotreatment mice showing little collagen fibers around the central vein with minimal collagen fibrils among hepatic cords.
Discussion

Doubts toward MSG gained popularity as taste enhancer in first half of twentieth century enhanced several researchers to investigate its possible pathological implications in human and experimental animals\(^1,2,6,37,38\). We aimed at reproducing the MSG hepatotoxicity model in mice and to test the ability of each of DDB and OPE to counter act MSG in this model. As a general toxicity marker, we observed changes in body and liver weights. Relative body weight was decreased in MSG-treated animals in a disagreement with report of Seiva et al\(^39\) showing gain of weight in MSG-treated rats. Grassioll et al\(^40\) stated that MSG causes hyperglycemia only in neonatal MSG-treated animals compared to adult. This was related to a lowered expression of GLUT4 protein in adipocytes\(^41\).

The increases in the serum liver function markers, ALT and AST activities, indicates liver damage\(^42\). Oxidative deamination of glutamate is the major source of free ammonium ions in the body with the liver as the major scavenger into urea. A possible ammonium ion overload following MSG intake in expected. Moreover, MSG could cause oxidative stress and cellular damage particularly to the liver. The enzyme leakage are produced due to mitochondrial and plasma membranes impairments\(^43\). The similar results and explanation were reported by Farombi and Onyema\(^2\) and Onyema et al\(^44\). This suggests that MSG administration in cases with impaired liver function is inappropriate. Furthermore, increases in serum ALT were strong positive indicators for insulin resistance, diabetes mellitus and obesity\(^45\). This indicates that MSG could interfere with central metabolism with morbid consequences reaching micro- and macro-vascular\(^46\). ALT level in the serum depicts the liver functional activity. An elevation in these enzymes activities suggests an influence due to the doses. Huber and his coworkers\(^47\) reported that unlike ALT levels, AST levels were not affected by MSG administration and they suggested that normalization of ALT levels with DDB treatment may not indicate a therapeutic effect. Serum albumin concentration decreased in MSG-treated mice. This indicates that not only the cell and membrane integrities were challenged, but also, molecularly, the synthetic ability of hepatocytes. Reportedly, not protein metabolism were impaired by MSG administration but also lipid metabolisms\(^48,49\). Moreover, the detoxication and secretory functions of the liver were also impaired since significant 3-fold increases in serum total bilirubin were observed upon MSG administration in the present study. SOD and catalase consecutively dispose superoxide radicals (O\(_2^−\)) and hydrogen peroxide (H\(_2\)O\(_2\))\(^50,51\). MSG administration significantly induced lipid peroxidation and declined SOD and catalase activities in liver. These finding are in agreement with Onyema et al\(^44\) and Hamza and AL-Harbi\(^52\), who observed MSG-induced oxidative stress comprising increased level of lipid peroxidation parallel with significant decline in SOD and catalase activities in hepatic tissues. Park et al\(^53\) suggested that oxidative stress causes altered lipid profile in MSG-induced hepatotoxicity model. Catalase activity is decreased in the liver during MSG exposure\(^54\). Since catalase is NADPH-dependent, reduction in NADPH production following MSG exposure might be the cause of reduced catalase activity\(^49,55\). This is corroborated with the previous research done by Singh et al\(^4\), pointing to the possibility that the decline in the activity of these enzymes could result from their inactivation by ROS and/or by their glycation.

One of the reasons for the reversal of MSG actions by cotreatment with either DDB or OPE is recovery of the vitamin and enzymic antioxidants reserve of hepatocytes\(^56,57\). Peel of citrus fruits contains significant amounts of the antioxidant phenolic compounds. Therefore, each of OPE and DDB supplementation increased the SOD and catalase activity in MSG-cotreated liver. These results are in agreement with studies observed potent antioxidant capacity for these two agents in both in vitro and in vivo studies\(^58-63\). Citrus flavonoids, especially hesperidin, have a wide range of therapeutic properties.
including analgesic, anti-inflammatory, antihypertensive, diuretic, and hypolipidemic activities\(^\text{64-66}\). Other researchers have reported that non-phenoic substances may also contribute to the anti-oxidant activity of OPE\(^\text{67}\). Moreover, Brand-Williams\(^\text{68}\) and his coworkers reported that the metal chelating capacity is significant since, it reduces the concentration of catalyzing transition metal in lipid peroxidation.

The co-administration of DDB with MSG caused a decrease in serum AST, ALT and bilirubin levels, and improved antioxidative parameters reflected as maintained structural integrity of liver cells. These results could be correlated with former researches, which depicted that DDB administration in female rats reduced the levels of oxidative biomarkers\(^\text{69,70}\). Furthermore, Faddah et al\(^\text{71}\) stated that DDB not only protects hepatocytes but also it increases their detoxication capacity, e.g., it reversed the effect of CCl\(_4\) on transaminases in rats. Gao and his coworkers\(^\text{19}\) depicted that hepatocyte DNA was protected from oxidative damage by DDB treatment. In their study, they demonstrated reduced levels of serum AST, ALT, total bilirubin and tumor necrosis factor α and reducing its messenger RNA expression in liver tissue. El Sawy et al\(^\text{72}\) mentioned that DDB significantly increased reduced glutathione and glutathione peroxidase and glutathione reductase activities, while significantly decreased malondialdehyde and glucose-6-phosphate dehydrogenase in both normal and chemically-injured liver. DDB reduced hepatic fatty degeneration induced by ethanol treatment in rats along with an inhibitory effect on malondialdehyde formation in liver homogenates\(^\text{73}\). The hepatocyte cell membrane damage was also reduced as detected by scanning electron microscope\(^\text{74}\).

The biochemical findings are assured from histopathological changes noticed in the current study which showed that treating mice with MSG caused histological alterations in the liver. These changes include destruction of the normal hepatic architecture and vacuolar degeneration, pyknotic and karyolitic nuclei of necrotic hepatocytes. These results are in agreement with Ortiz et al\(^\text{49}\), who reported degenerative changes in hepatocyte after a single high dose intraperitoneal injection of MSG in rats. Also, Eweka and Om’Iniabohs\(^\text{75}\) noted the presence of hemolyzed RBCs in the central vein, hemorrhagic necrosis is centrilobular, disruption of architecture of liver, and hepatocyte degradation and hypertrophy of Kupffer cells as a response to oral MSG in adult Wister rats. In the same line, El Sawy et al\(^\text{72}\) showed an improvement histology the liver upon DDB administration after MSG treatment. Histopathologically, high doses of DDB protected against CCl\(_4\)-induced toxicity with mild vacuolar degeneration and fatty changes\(^\text{76}\). Our findings indicated that each of DDB and OPE induced limited hepatocellular injury and exert antifibrotic effect. This is in agreement with Abdel-Salam et al\(^\text{76}\) who conducted morphometric analysis of Masson’s trichrome stained liver sections from rats exposed to CCl\(_4\) and treated with DDB. They observed significant decrease liver fibrosis when CCl\(_4\) is cotreated with high dose of DDB. On the contrary, Kang et al\(^\text{77}\) using dimethyl nitrosamine-induced liver fibrogenesis, did not find such antifibrotic DDB activity.

**Conclusion**

The findings of the current study showed that MSG at a low dose could produce changes in the weight of the liver and body with alterations in liver histology and functions. These changes appear more prominently in the liver. Each of DDB and OPE co-administrated with MSG proved hepato-protectant ability correlating improvement in liver synthetic and detoxication functions and prevention/restoration of the investigated antioxidative mechanisms.

**Limitations of the Study**

Although the research has reached its aims, there were some limitations. An extra group to assess the synergistic effect of a cotreatment with both DDP and OPE on MSG-induced hepatotoxicity was needed.
**Funding**

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**Conflict of Interest**

The authors declared no conflict of interests.

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Wahab & Ibrahim

Protective Effect of Diphenyl Dimethyl Bicarboxylate and

Original Article

A Survey of the Level and Source of Knowledge and Practice of Glaucoma Management in an Adult Population in an Eastern City of Saudi Arabia

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Abstract

Background: Knowing the extent of the community’s knowledge and practice concerning glaucoma management as a blinding disease and the factors that contribute to it could help effectively combating it. Such knowledge and practice are the foundation on which eye health promotion is planned worldwide.

Objective: To review the level of knowledge and practice of glaucoma in an adult Saudi Population in Diharan, Saudi Arabia.

Participants and Methods: A survey was conducted during January 2017 on adult Saudis visiting a city mall. The participants were presented with a questionnaire with closed-ended questions. Data were collected on demographics, knowledge of glaucoma, its consequences and management, current pattern for eye care screening and sources of knowledge. Data were analyzed to determine the level of knowledge and eye screening visits. For data stratification, the responses were graded as excellent (>75% score), good (51 - 75%) and poor (25 - 49%). The data were analyzed for an association between the score and demographic variables.

Results: Two hundred and ten adults were interviewed. Fifty-six participants [26.7% (95% Confidence Interval (CI): 20.7 – 32.6)] had an excellent knowledge of glaucoma, 119 participants [56.6% (95% CI: 50.0 – 63.4)] had good knowledge and 35 participants [16.7% (95% CI: 11.6 – 21.7)] had poor knowledge. There was no significant difference in knowledge between genders (P = 0.85), age groups (P = 0.2) or education level (P = 0.2). Seventy-five participants [35.7% (95% CI: 29.2 – 42.2)] had an eye check-up for glaucoma in the previous year. Source of information on glaucoma were mass media, healthcare providers and friends/relatives among 47 (22.4%), 75 (35.7%) and 60 (29.1%) participants, respectively.

Conclusion: The knowledge of glaucoma among urban Saudi adults is less than desired. Public health education strategies are needed to improve this community’s glaucoma-related knowledge so that they present regularly for eye screening for the early detection and timely management of glaucoma.

Keywords: Glaucoma, Knowledge, Practice, Awareness.

**Introduction**

Glaucoma is a disease that causes blindness is often termed “a silent thief of vision”. Glaucoma is a chronic asymptomatic disease that is often detected during routine eye exams. In other cases, it is detected in the advanced stages when the quality of vision is affected. Treatment of glaucoma aims to halt the progression of damage and delay severe visual disability. All cases of glaucoma need lifelong monitoring by an ophthalmologist. Hence, patient cooperation and adherence to the treatment regimen is fundamental for the successful management of glaucoma. Disease awareness and knowledge of disease management among patients influences their adherence to glaucoma treatment. However, adherence also varies by race and gender. Hence, glaucoma-related data on knowledge, attitude and practices (KAP) in a specified population would help improve healthcare programs that address visual disabilities due to this disease.

This survey determined the level of knowledge and practice of glaucoma management among glaucoma patients from Dhafran, a city in the Eastern province of Saudi Arabia.

**Participants and Methods**

In this study of the knowledge and practice of glaucoma management, we enrolled adults visiting a mall in Dhafran, Saudi Arabia. A close ended questionnaire as survey instrument was used to collect data. This study was approved by the ethical and research board of Dammam University. As this was a convenient sample based cross-sectional study, only informed verbal consent from the participants was obtained. This study enrolled adults over 18 years old from the Saudi Population visiting a mall during January 2017. Adults consenting to participate were included.

We assumed that the level of knowledge regarding glaucoma was 8.3% in the population. To achieve a 95% confidence interval (CI), 4% acceptable error margin in a population of 100,000 in the city and using 1.2 as a factor for clustering, a study sample of 212 adult Saudis was required. Epi Calculator of Open Epi software was used to calculate the sample size.

Two medical students were the field investigators for this study. A pretested questionnaire in Arabic was used to train the medical students in standardizing the survey method. The questionnaire used three response options namely: Yes, No and I don’t know.

Data were anonymously collected on participant age, gender and education level. There were four questions related to the knowledge about glaucoma as a disease, its risk factors and its consequences if left untreated. There were five questions on the cause of glaucoma and its symptoms. They were first tested on 10 non-health personnel and accordingly were revised. The responses were compared with the responses of three experts (two glaucoma specialists and one general ophthalmologist). A response was considered correct if the response of the experts and participant matched. Each correct response was allotted a +2 score. Each incorrect response was allotted a -2 score. A score of 0 was noted for ‘I do not know’ responses. The sum of all responses related to awareness was further grouped into: ‘excellent’ if it was >75% of the total possible score; ‘good’ if it was 51 to 75%; ‘poor’ if it was 25 to 49 and; ‘very poor’ if it was less than 25%.

The participant was asked if he/she is suffering from glaucoma as declared by eye doctor. Those replying yes were requested to reply to one more question regarding regular follow up and glaucoma screening was included. Data on the source of information on glaucoma was queried.

Data were transferred to an Excel® spreadsheet 2013 (Microsoft Corp., Redmond, WA, USA). Univariate analysis using parametric method was performed with Statistical Package for the Social Studies (SPSS – 24) (IBM Corp., Armonk, NY, USA). Qualitative variables are presented as frequency and percentage proportions. Quantitative variables were reviewed for a normal distribution and the mean and standard deviation are
presented in this study. P <0.05 indicates statistical significance.

**Results**

Of the 245 persons approached for participation, 220 agreed to participate with response rate of 90%. Among participants, 10 being non-Saudi were excluded from the analysis. Thus, 210 Saudi adult respondents’ data were analyzed. The demographic profile of the study sample is presented in Table 1. Most of the participants were older than 40 years of age. There were 143 (68.3%) females. There were 74 (35.2%) individuals aged 41 to 60 years and 56.2% of individuals aged 41 to 60 years. One hundred and twenty-three (58.6%) participants were college graduates and 58 (27.6%) were school graduates. Ten (4.8%) participants did not complete school and 16 (9%) had a postgraduate education.

The level of knowledge among populations from previous studies is presented in Table 2. The practice of eye check-up for glaucoma in last year was noted in 75 [35.7% (95% CI 29.2 – 42.2)] participants. The principal source of information on glaucoma was mass media for 47 (22.4%) individuals, healthcare providers for 75 (35.7%) and friends and relatives for 60 (29.1%) individuals.

### Table 1: Factors affecting the level of knowledge (K) regarding glaucoma in adult Saudi population of Dhahran.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Excellent K</th>
<th>Poor + Good K</th>
<th>Validation</th>
</tr>
</thead>
</table>
|                         | n | % | n | % | P = 0.85 | \(X^2 = 2,\)  
| Gender: Male/Female     | 16/40 | 28.6/71.4 | 50/104 | 32.5/67.5 | df = 2,  
| Age group:              | 2 | 3.6 | 8 | 5.2 | P = 0.2 |
| ≤40                     | 2 | 3.6 | 8 | 5.2 | \(X^2 = 2,\)  
| 40 - 59                 | 25 | 44.6 | 50 | 32.5 | df = 3,  
| ≥60                     | 28 | 50.0 | 99 | 64.3 | P = 0.2 |
| Education:              |          |              |          |          |          |
| School graduate         | 48 | 85.7 | 141 | 91.6 |          |
| College/Higher education| 8 | 14.3 | 12 | 7.8 |          |

\(df = \) degree of freedom.

**Discussion**

The outcomes of this survey indicate that only a one-fourth of the adult participating Saudi population had the desired level of glaucoma related knowledge. In a country with free healthcare services, practice of routine eye health screening exams in one-third of the adult population in one year requires improvement. In the current study, glaucoma-related knowledge is still imparted by healthcare providers in one-third of population. The outcomes of this survey indicate that mass media for educating the public about glaucoma needs to be utilized more extensively.

In central Saudi Arabia, the prevalence of glaucoma in 40 years and older population is 4.75% (Personal communication; Dr Rajiv Khandekar, A presentation at the Saudi Ophthalmology Conference, 2017). In South Saudi Arabia, 5% of total blindness, among 50 years and older population was due to glaucoma\(^\text{99}\). Thus, to address the visual disabilities due to glaucoma, early detection and uptake of standard management are essential. Hence, there need to increased awareness of glaucoma in the community we evaluated. The baseline information on knowledge and practice generated from the current study is important for enhancing public health initiatives in the eastern province of Saudi Arabia.

There is a wide range of the level of knowledge about glaucoma among communities evaluated in previous studies (Table 2)\(^{10-11,19}\). African countries with
less education had a lower level of knowledge compared to countries with high per capita incomes and better education. The knowledge of glaucoma was lower than for cataracts and diabetic retinopathy\(^1\). In the present study none of the known factors such as age, gender and education were associated to the level of knowledge of glaucoma. These observations concur with a previous study from central India\(^2\). The older age of the participants had been positively associated to greater knowledge about glaucoma\(^3,4\). Visual impairment in old age and greater chances of interaction with eye care providers could be a factor for the improved knowledge in older ages.

Table 2: Knowledge (K) about glaucoma among healthy population in different studies.

<table>
<thead>
<tr>
<th>#</th>
<th>Author</th>
<th>Year</th>
<th>Sample</th>
<th>Country</th>
<th>K level</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alemu et al(^{10})</td>
<td>2017</td>
<td>701</td>
<td>Ethiopia</td>
<td>35.1%</td>
<td>Education and age associated to K.</td>
</tr>
<tr>
<td>2</td>
<td>Maharana et al(^{11})</td>
<td>2017</td>
<td>1,400</td>
<td>India</td>
<td>27%</td>
<td>Eye department. Adults. Education associated to high K.</td>
</tr>
<tr>
<td>3</td>
<td>De-Gaulle and Dako-Gyeke(^{12})</td>
<td>2016</td>
<td>300</td>
<td>Ghana</td>
<td>99.1%</td>
<td>Peri-urban population. Age &amp; education associated to high K. 20.7% practice.</td>
</tr>
<tr>
<td>4</td>
<td>Isawumi et al(^{13})</td>
<td>2014</td>
<td>259</td>
<td>Nigeria</td>
<td>15.8%</td>
<td>Adults, Rural. Males, older population and teachers associated to good K.</td>
</tr>
<tr>
<td>5</td>
<td>Shrestha et al(^{14})</td>
<td>2014</td>
<td>1,741</td>
<td>Nepal</td>
<td>21.3%</td>
<td>Higher education and female associated to good K about glaucoma.</td>
</tr>
<tr>
<td>6</td>
<td>Altangerel et al(^{15})</td>
<td>2009</td>
<td>222</td>
<td>USA</td>
<td>73%</td>
<td>29% accurate in defining glaucoma. Practice 60%.</td>
</tr>
<tr>
<td>7</td>
<td>Katibeh et al(^{16})</td>
<td>2014</td>
<td>1,084</td>
<td>Iran</td>
<td>46.6%</td>
<td>Awareness of glaucoma was lower than cataract and diabetic retinopathy.</td>
</tr>
<tr>
<td>8</td>
<td>Tenkir et al(^{17})</td>
<td>2010</td>
<td>340</td>
<td>Ethiopia</td>
<td>2.4%</td>
<td>Higher education related to good K about glaucoma.</td>
</tr>
<tr>
<td>9</td>
<td>Labiris et al(^{18})</td>
<td>2012</td>
<td>489</td>
<td>Greece</td>
<td>4.43 ± 2.1 (Rasch score)</td>
<td>Income and family history predictor of awareness for glaucoma.</td>
</tr>
<tr>
<td>10</td>
<td>Al Rasheed et al(^{19})</td>
<td>2017</td>
<td>711</td>
<td>KSA</td>
<td>14.8%</td>
<td>Part of all eye diseases K.</td>
</tr>
<tr>
<td>11</td>
<td>Present study</td>
<td>2017</td>
<td>210</td>
<td>KSA</td>
<td>26.7%</td>
<td>Adult Saudi population.</td>
</tr>
</tbody>
</table>

KSA = Kingdom of Saudi Arabia.

A Nigerian study reported significantly higher levels of knowledge of glaucoma among males\(^{13}\). However, females had greater knowledge in Nepal\(^{14}\). The female population in our study area was educated which may explain the similar levels of knowledge of glaucoma among genders. Higher education is significantly associated to a better level of knowledge in most of the published literature\(^{10-12,13}\). Ability to access knowledge using modern technology and communicate
with healthcare providers and educators could explain higher levels of knowledge among educated individuals.

In the current study, only one-third of the surveyed population, majority of whom more than 40 years of age had undergone an eye check-up in the previous year. This observation is disconcerting given the high prevalence (25.4%) of diabetes in the population aged 30 years or older. This low practice reflects the lack of universal diabetic retinopathy screening in the study area. Opportunistic glaucoma screening while attending ophthalmic clinics even during a check for presbyopia is recommended. If these opportunistic exams are not performed glaucoma may be missed or detected in the late stages with significant visual morbidity.

The scant usage of mass media for seeking knowledge regarding health issues including glaucoma and relying on healthcare providers for health knowledge noted in our study should addressed while enhancing health promotion initiatives in the study area. There were some limitations in our study. Our study although was a cross-sectional, the sample was convenient one and not the random one. In addition, less representation of younger participants and educated participants could affect the generalization of study outcomes. Therefore, study outcome should be limited to interviewed population and extrapolation of study outcome to entire population should be done with caution. Use of five graded Likert scale to collect the responses and a Rasch scale to evaluate the knowledge would have further improved the reliability of this study.

To improve awareness and as uptake of periodic screening for glaucoma, health literacy initiatives about glaucoma in study area is recommended. Various strategies are effective at promoting health care to the general population, including, eye health education programs, educational workshops and public education campaigns. There is an urgent need for establishing an information, education and communication (IEC) strategy so that glaucoma can be diagnosed in early stages and patients cooperation can be improved for adhering to the management regimen.

**Conclusion**

The knowledge of glaucoma among urban Saudi adults is less than desired. Public health education strategies are needed to improve this community’s glaucoma-related knowledge so that they present regularly for eye screening for the early detection and timely management of glaucoma.

**Limitations of the Study**

The conventional five-point Likert scale was not used in the questionnaire as it may complicate the simplicity of questionnaire to our sample and also to avoid uncertain answers by participants. Hence, a three-point scale was used instead.

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**Conflict of Interest**

The authors declared no conflict of interests.

**References**


**Original Article**

**Kat Use and Mental disorders as Assessed by the Symptom Checklist-90-Revised**

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**Abstract**

**Background:** Kat is a tree that grows in Yemen and some African countries. Its presence in Yemen has become popular due to the vastness of the agricultural areas in which it is grown, and also because of the large number of users.

**Objectives:** This cross-sectional study aimed to investigate the reliability and validity of the Symptom Check-List-90-Revised (SCL-90-R) and the prevalence of mental disorders in Yemeni Kat chewers.

**Participants and Methods:** The study population is consisted of 227 adult males who were assessed at Kat sessions in Sana'a and Taiz through 2016 using SCL-90-R.

**Results:** SCL-90-R showed good internal consistency for all sub-scales ($\alpha = 0.84$ - 0.91) and excellent consistency for the total scale ($\alpha = 0.985$). PCA revealed one general factor, which accounted for 69.55% of the total variance. Hostility has the highest prevalence rate of mental disorders among Kat chewers with 23.529%, followed by anxiety (20.588%), phobic-anxiety (19.41%), interpersonal sensitivity (18.23%), psychoticism (18.23%), somatization (17.647%), obsession-compulsive (17.058%), depression (15.88%) and paranoid ideation (12.35%). The results of the study showed significant differences between Kat chewers and non-chewers in relation to all nine mental disorders. We found significant differences in hostility and psychoticism among those who chew Kat four or five times a week or those who chew it every day compared with those who chew it once or twice a week.

**Conclusion:** SCL-90-R has high internal consistency and good construct validity. Yemeni males who chew Kat are more likely to becoming mentally ill.

**Key words:** Kat chewers, Yemen, Prevalence rates, Symptom Check-List-90-Revised, Validation.

**Citation:** Fadhel FH. Kat Use and Mental disorders as Assessed by the Symptom Checklist-90-Revised. AUMJ, March 1, 2017; 4(1): 21 - 29.
Introduction

Kat (also called Khat, Qat and Chat) is a green tree that grows in temperate and relatively warm regions, and its use is widely prevalent in countries like Yemen, Kenya, Somalia, Ethiopia and Djibouti and an increasing pattern is reported from some other countries such as Oman and Saudi Arabia. Its presence in Yemen has become popular due to the vastness of the agricultural areas in which it is grown, and also because of the large number of users. It is associated with traditions of deep cultural and social roots among some peoples of East Africa and Yemen.(1)

The fact that Kat is not considered by the World Health Organization (WHO) to be a “seriously addictive drug”, does not mean that its consumption is without physiological repercussions(2). However, Kat use is an addiction problem, which is a widespread culturally, accepted practice in some countries. Some authors argue that the effectiveness of Kat lies in a volatile substance emitted from the branches and leaves of this tree called cathinone, which is responsible for the mood state and psychological changes that Kat provides to users. However, using cathinone in pharmaceutical forms independently from other components of Kat does not lead to the same effect of Kat, and this may not fully reflect the behavioral and psychological effects observed in similar studies on Kat effects.(1) The difference in the effects of Kat and cathinone extract may be due to the existence of other substances in Kat that contribute to its effect, although the researchers have interpreted the reduced effect of cathinone extract to the session of Kat intake and to the preparation for this session.(4) However, this interpretation has not been supported by the studies carried out so far and does not apply to cases where Kat is taken while walking, driving or in public markets.

The psychological changes of Kat were classified into three stages: 1) Stage of ecstasy and moderate excitement that lasts an hour or two at least(5,6), 2) Stage of self-awareness, arousal and resistance to fatigue; the individual reaches the peak of this stage within 1.5-3.5 hours of starting to eat Kat(7). And, 3) Stage of discomfort, anesthesia, anxiety, depressive mood, insomnia, and loss of appetite; it usually occurs at the end of the Kat session and then lasts for a few hours.(8).

The relationship between Kat use and mental health has been noted in other reports(9-11). However, it is not clear whether Kat causes mental disorders that never existed before, or whether it exacerbates already existing psychological problems. Bhui et al(10) found suicidal thoughts to be more common among Somali immigrants who were chewing Kat in the UK. Pennings and colleagues(12) have shown that people who use Kat describe two types of mental disorders: paranoid or schizophrenic psychosis (similar to that caused by amphetamine) and psychosis. Schechter and colleagues(13) believe that Kat stimulates the sympathetic nervous system in a similar way to the effect of amphetamine. While there are some brief psychotic manifestations that appear after chewing Kat, especially confusion, disorientation, paranoid fantasies and depressed mood, Kat also stimulates other types of psychotic symptoms including loss of appetite, apathy, hypomania, and tension. Others have pointed out that schizophrenia and mania are the mental disorders that most frequently appear in Kat chewers, followed rarely by depression(14). Dires and colleagues(15) showed that 22.2% of those suffering from psychological distress were Kat users and 9.2% had suicidal thoughts. Some studies found a relationship between chewing large amounts of Kat and mental symptoms. Patients who take large quantities of Kat describe paranoid delusions, fear, a hostile perception of the environment, auditory hallucinations, delusions of reference, feelings of alienation, and a tendency to isolate themselves from others or engage in aggressive behavior toward others(11,12,16,18).

Gorfu(11) found a relationship between Kat use and psychotic manifestations in one case. Other reports discussed the relationship between chewing Kat and the onset of mental disorders, where the symptoms of the mental disorders not
only related to the use of Kat but also to the early onset of use and excessive use of Kat\textsuperscript{[19,20].} Hassan and his colleagues\textsuperscript{[68]} found a significant increase in distress among Yemeni Kat chewers compared to non-chewers, while Kat may exacerbate the existence of psychological distress in the individual\textsuperscript{[4,10]}.

The Symptom Checklist (SCL-90) is used to "study the efficacy of psychotropic drugs and contains questions referring to the symptomatic behavior of outpatients\textsuperscript{[21]}. Several studies have examined the performance of this scale in patient materials\textsuperscript{[22,23]}. It was translated into many languages with good validity and reliability\textsuperscript{[23]}. However, we did not find a good translated version of this scale in Arabic. Therefore, this study aimed at identifying the prevalence rates of mental disorders among Kat chewers at Yemen as assessed by SCL-90-R, and to examine the validity and reliability of SCL-90-R.

**Participants and Methods**

**The study population:** The sample of this study consisted of 227 Yemenis males (170 Kat chewers and 57 non-chewers), selected during random visits to Kat sessions in Sana’a and Taiz during 2016. Participants voluntarily verbally agreed to anonymously participate in the investigation and the study was approved by the local bioethics committee at Faculty of Education, King Khalid University, Riyadh, Saudi Arabia.

**Data collection tool:** SCL-90-R\textsuperscript{[24,25]} was used in this study after the author translated it into Arabic. The demographic data collected were age, marital status, level of education completed, whether or not they chew Kat, the duration in years from the onset of chewing Kat until now, and the number of days they chew each week. The participants answered the questionnaire during Kat sessions in Sana’a and Taiz. SCL-90-R is a self-reported scale consisting of 90 items covering nine mental disorders and eight miscellaneous items. It is widely used to measure psychological distress and psychopathological symptoms in psychiatric patients and non-patients in the community\textsuperscript{[26]}. The reliability was assessed using internal consistency (Cronbach’s alpha) and the split-half in the nine dimensions (nine mental disorders) and in the total scale.

**Statistical analysis:** The data in this study were analyzed using SPSS, Version 16 (SPSS Inc. and Chicago, IL, USA). Descriptive statistics were used to assess demographic and clinical variables such as age, level of education, marital status, duration since onset of Kat use and the number of days they chew Kat per week.

Reliability (internal consistency) was assessed by Cronbach’s α coefficient. Values equal to or in excess of 0.70 were considered satisfactory\textsuperscript{[27]}. Construct validity was assessed.

**Results**

**Descriptive statistics for the study sample**

The age range of respondents was 20 - 51 years and the mean age was 35.16 years (SD ± 7.825). 39.20% of them completed secondary school of education, 46.25% had bachelor certificates, 6.60% had a master’s degree, and 7.93% had a PhD. A high percentage 74.88% of them (77.05% of chewers and 68.42% of non-chewers) were married, and 16.74% (16.47% of chewers and 17.54% of non-chewers) were single, and the percentage of who were separated was 8.37% for both groups. Known individuals with psychiatric disorders were excluded.

The duration since onset of Kat use was more than 16 years for 60 respondents (35.29%) in the chewers group, and between 10 - 15 years in 58 respondents (34.11%). For 52 respondents (30.58%) it was between 1 - 9 years. A high percentage (49.41%) of chewers said they chew Kat every day, 40 respondents (23.52%) said they chew between five and six days a week, 25 respondents (14.70%) chew it one or two days a week, and 21 respondents (12.35%) chew it three or four days a week. Table 1 shows descriptive statistics for the study sample.

**Internal consistency**

The internal consistency (Cronbach’s α) of SCL-90-R was excellent. As shown in Table 2 there were good consistencies for all sub-scales and this coefficient was very high for the total scale (0.985).
Table 1: Descriptive statistics for the study sample of Yamani Kat chewers and non-chewers investigated for mental disorders as assessed by the Symptom Checklist-90-Revised.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chewers</th>
<th>Non-Chewers</th>
<th>Total, n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Range 20-51</td>
<td>Range 20-51</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Mean 34.76 ± 7.88</td>
<td>Mean 36.37 ± 7.57</td>
<td>-</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>n 28, % 16.47</td>
<td>n 10, % 17.54</td>
<td>38</td>
</tr>
<tr>
<td>Married</td>
<td>131, 77.05</td>
<td>39, 68.42</td>
<td>170</td>
</tr>
<tr>
<td>Separated</td>
<td>11, 6.47</td>
<td>8, 14.03</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>170, 100%</td>
<td>57, 100%</td>
<td>227</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Certificate</td>
<td>65, 38.23</td>
<td>24, 42.10</td>
<td>89</td>
</tr>
<tr>
<td>Bachelor</td>
<td>81, 47.64</td>
<td>24, 42.10</td>
<td>105</td>
</tr>
<tr>
<td>Master's Degree</td>
<td>12, 7.058</td>
<td>3, 5.26</td>
<td>15</td>
</tr>
<tr>
<td>PhD</td>
<td>12, 7.058</td>
<td>6, 10.52</td>
<td>18</td>
</tr>
<tr>
<td>Duration since onset of Kat use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 1-9 Years</td>
<td>52, 30.58</td>
<td>-</td>
<td>52</td>
</tr>
<tr>
<td>Between 10-15 Years</td>
<td>58, 34.11</td>
<td>-</td>
<td>58</td>
</tr>
<tr>
<td>More than 16 Years</td>
<td>60, 35.29</td>
<td>-</td>
<td>60</td>
</tr>
<tr>
<td>Number of days chewing per week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 or 2 days</td>
<td>25, 14.70</td>
<td>-</td>
<td>25</td>
</tr>
<tr>
<td>3 or 4 days</td>
<td>21, 12.35</td>
<td>-</td>
<td>21</td>
</tr>
<tr>
<td>5 or 6 days</td>
<td>40, 23.52</td>
<td>-</td>
<td>40</td>
</tr>
<tr>
<td>Every day</td>
<td>84, 49.41</td>
<td>-</td>
<td>84</td>
</tr>
</tbody>
</table>

Table 2: Reliability of SCL-90-R applied on Kat chewing Yamani males. Cronbach’s α = C α.

<table>
<thead>
<tr>
<th></th>
<th>Ca.</th>
<th>Split-half</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatization</td>
<td>0.89</td>
<td>0.786</td>
</tr>
<tr>
<td>Obsession-compulsive</td>
<td>0.88</td>
<td>0.717</td>
</tr>
<tr>
<td>Interpersonal sensitivity</td>
<td>0.89</td>
<td>0.769</td>
</tr>
<tr>
<td>Depression</td>
<td>0.90</td>
<td>0.786</td>
</tr>
<tr>
<td>Anxiety</td>
<td>0.89</td>
<td>0.75</td>
</tr>
<tr>
<td>Hostility</td>
<td>0.84</td>
<td>0.71</td>
</tr>
<tr>
<td>Phobic-anxiety</td>
<td>0.87</td>
<td>0.757</td>
</tr>
<tr>
<td>Paranoid ideation</td>
<td>0.84</td>
<td>0.705</td>
</tr>
<tr>
<td>Psychoticism</td>
<td>0.91</td>
<td>0.775</td>
</tr>
<tr>
<td>Additional</td>
<td>0.84</td>
<td>0.698</td>
</tr>
<tr>
<td>Total</td>
<td>0.985</td>
<td>0.909</td>
</tr>
</tbody>
</table>

Construct validity
The construct validity of the SCL-90-R was assessed. The correlation between the 10 sub-scales, and its correlations with total scale were significant and ranged from 0.74 (hostility with miscellaneous items) to 0.769 (total scale with interpersonal sensitivity, depression and anxiety), as shown in Table 3. This study also found significant correlations between an item and its own sub-scale (Table 4).

Factor analysis (Principal Component Analysis or PCA) demonstrated that all 90 items loaded significantly in one general factor. The factor loadings ranged from 0.454 (worried about sloppiness) to 0.94 (feeling lonely with others). Also, on the sub-scale level, all 10 sub-scales loaded significantly in one general factor.

The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.95 and the Bartlett test was significant (p <0.005). We could not complete the Confirmatory Factor Analysis (CFA) of SCL-90-R because the sample was too small.

Prevalence rates of mental disorders
The prevalence rates were calculated by counting the number of individuals who obtained a score equal to or greater than the total of mean and standard deviation of the chewers group in each disorder. Hostility prevalence comes first in the prevalence rates of mental disorders among Kat chewers with 23.529%, then comes anxiety with 20.588%, phobic-anxiety 19.41%, interpersonal sensitivity...
18.23%, psychoticism 18.23%, somatization 17.647%, obsession-compulsive 17.058%, depression 15.88% and paranoid ideation 12.35%. The prevalence of additional symptoms is 21.176%. These results are presented in Table 5.

Table 3: Construct validity of SCL-90-R (correlation between sub-scales and its loading in factor 1) applied on Kat chewing Yamani males. All correlations are significant at the 0.01 level (2-tailed). Somatization = Som, Obsession = Obs, Interpersonal sensitivity = Int, Depression = Dep, Anxiety = Anx, Hostility = Hos, Phobic-anxiety = Pho, Paranoid ideation = Par, Psychoticism = Psy, Miscellaneous = Mis, Total scale = TS, Factor 1 = F1, and, Variance = Var.

<table>
<thead>
<tr>
<th>Items</th>
<th>1</th>
<th>4</th>
<th>11</th>
<th>29</th>
<th>40</th>
<th>42</th>
<th>48</th>
<th>49</th>
<th>52</th>
<th>58</th>
<th>71</th>
</tr>
</thead>
<tbody>
<tr>
<td>Som</td>
<td>0.69</td>
<td>0.68</td>
<td>0.74</td>
<td>0.73</td>
<td>0.71</td>
<td>0.72</td>
<td>0.74</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.66</td>
</tr>
<tr>
<td>Obs</td>
<td>0.62</td>
<td>0.69</td>
<td>0.56</td>
<td>0.71</td>
<td>0.73</td>
<td>0.71</td>
<td>0.72</td>
<td>0.74</td>
<td>0.75</td>
<td>0.75</td>
<td>0.77</td>
</tr>
<tr>
<td>Int</td>
<td>0.64</td>
<td>0.70</td>
<td>0.76</td>
<td>0.75</td>
<td>0.76</td>
<td>0.78</td>
<td>0.71</td>
<td>0.78</td>
<td>0.74</td>
<td>0.74</td>
<td>0.74</td>
</tr>
<tr>
<td>Dep</td>
<td>0.65</td>
<td>0.64</td>
<td>0.69</td>
<td>0.53</td>
<td>0.66</td>
<td>0.74</td>
<td>0.69</td>
<td>0.64</td>
<td>0.72</td>
<td>0.74</td>
<td>0.69</td>
</tr>
<tr>
<td>Anx</td>
<td>0.71</td>
<td>0.72</td>
<td>0.76</td>
<td>0.70</td>
<td>0.62</td>
<td>0.67</td>
<td>0.72</td>
<td>0.77</td>
<td>0.67</td>
<td>0.74</td>
<td>0.74</td>
</tr>
<tr>
<td>Hos</td>
<td>0.73</td>
<td>0.78</td>
<td>0.74</td>
<td>0.76</td>
<td>0.64</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
<td>0.78</td>
</tr>
<tr>
<td>Pho</td>
<td>0.74</td>
<td>0.74</td>
<td>0.76</td>
<td>0.67</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
</tr>
<tr>
<td>Par</td>
<td>0.74</td>
<td>0.75</td>
<td>0.77</td>
<td>0.70</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
<td>0.77</td>
</tr>
<tr>
<td>Psy</td>
<td>0.76</td>
<td>0.67</td>
<td>0.67</td>
<td>0.74</td>
<td>0.78</td>
<td>0.67</td>
<td>0.77</td>
<td>0.78</td>
<td>0.80</td>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>Mis</td>
<td>0.65</td>
<td>0.67</td>
<td>0.69</td>
<td>0.68</td>
<td>0.67</td>
<td>0.69</td>
<td>0.72</td>
<td>0.67</td>
<td>0.67</td>
<td>0.67</td>
<td>0.67</td>
</tr>
</tbody>
</table>

In addition, there are significant differences between Kat chewers and non-chewers in these mental disorders as shown in Table 6. The group of Kat chewers has high means in all nine disorders compared with the group of non-chewers.

The results of this study revealed significant differences in hostility between those who use Kat four or five
times a week and those who chew it once or twice a week. It also found significant differences in psychoticism between those who chew Kat every day and those who chew it once or twice a week. There are no statistically significant differences between Kat chewers according to duration from onset of Kat use.

Table 5: Prevalence rates of mental disorders among males chewing Kat.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatization</td>
<td>18.49</td>
<td>7.866</td>
<td>30</td>
<td>17.647</td>
</tr>
<tr>
<td>Obsession- compulsive</td>
<td>17.87</td>
<td>7.181</td>
<td>29</td>
<td>17.058</td>
</tr>
<tr>
<td>Interpersonal sensitivity</td>
<td>14.35</td>
<td>7.485</td>
<td>31</td>
<td>18.23</td>
</tr>
<tr>
<td>Depression</td>
<td>22.088</td>
<td>9.76</td>
<td>27</td>
<td>15.88</td>
</tr>
<tr>
<td>Anxiety</td>
<td>15.81</td>
<td>8.48</td>
<td>35</td>
<td>20.588</td>
</tr>
<tr>
<td>Hostility</td>
<td>9.347</td>
<td>5.106</td>
<td>40</td>
<td>23.529</td>
</tr>
<tr>
<td>Phobic- anxiety</td>
<td>10.83</td>
<td>6.065</td>
<td>33</td>
<td>19.41</td>
</tr>
<tr>
<td>Paranoid ideation</td>
<td>9.729</td>
<td>5.188</td>
<td>21</td>
<td>12.35</td>
</tr>
<tr>
<td>Psychoticism</td>
<td>14.24</td>
<td>8.620</td>
<td>31</td>
<td>18.23</td>
</tr>
<tr>
<td>Additional</td>
<td>14.688</td>
<td>5.881</td>
<td>36</td>
<td>21.176</td>
</tr>
</tbody>
</table>

Table 6: Differences in mental disorders between Kat chewers and non-chewers.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Somatization</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>18.49</td>
<td>7.866</td>
<td>7.995</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>7.508</td>
<td>9.319</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obsession- compulsive</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>17.87</td>
<td>7.181</td>
<td>6.178</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>8.79</td>
<td>10.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpersonal sensitivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>14.35</td>
<td>7.485</td>
<td>8.106</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>5.456</td>
<td>7.056</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>22.088</td>
<td>9.76</td>
<td>7.976</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>9.052</td>
<td>10.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>15.81</td>
<td>8.48</td>
<td>8.248</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>5.719</td>
<td>7.823</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hostility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>9.347</td>
<td>5.106</td>
<td>10.306</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>2.75</td>
<td>3.818</td>
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</tr>
<tr>
<td>Phobic-anxiety</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>10.83</td>
<td>6.065</td>
<td>9.523</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>3.245</td>
<td>4.885</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paranoid ideation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>9.729</td>
<td>5.188</td>
<td>8.711</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>3.403</td>
<td>4.585</td>
<td></td>
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</tr>
<tr>
<td>Psychoticism</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>14.24</td>
<td>8.620</td>
<td>8.595</td>
<td>0.05</td>
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<tr>
<td>Non-chewing</td>
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<td></td>
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<tr>
<td>Additional</td>
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<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>14.688</td>
<td>5.881</td>
<td>6.881</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>7.245</td>
<td>7.421</td>
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<td>total</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Chewing</td>
<td>1.474</td>
<td>64.156</td>
<td>8.749</td>
<td>0.05</td>
</tr>
<tr>
<td>Non-chewing</td>
<td>57.66</td>
<td>67.99</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Discussion**

This study found high reliability and good validity coefficients in SCL-90-R. The internal consistency (Cronbach’s alpha) was higher in the total scale and in all nine sub-scales. As demonstrated by the coefficient alpha shown in Table 3, the SCL-90-R scale demonstrated excellent reliability for the total ($\alpha = 0.985$) as well as for the 10 sub-scales (range in $\alpha = 0.84 - 0.91$).

In line with this result, Vallejo and his colleagues found high Cronbach’s a
coefficient (a = 0.97) for both the paper version and the Internet version of SCL-90-R. The study by Øiesvold and colleagues\(^{29}\) obtained high Cronbach’s \(a\) coefficient in the 10 sub-scales ranging from 0.87 (in somatization and depression) to 0.69 (in additional symptoms) to 0.97 in total score, whereas its ranged from 0.76 (in paranoid ideation) to 0.89 (in hostility)\(^{23}\). The result of Cronbach's \(a\) demonstrated internal consistency in SCL-90-R. However, the split-half coefficients were lower than internal consistency in the sub-scales and higher in the total scale.

The relationships between sub-scales and the total score of the scale (construct validity) were highly significant (P <0.01). In addition, each of the 90 items was found to be significantly related (via item-total correlation) to the total sub-scales, demonstrating the construct validity in the scale.

Factor analysis (PFA) supported the theoretical one-dimensional structure of the SCL-90-R scale regardless of the multivariate normal assumption\(^{23}\). The one-factor structure of SCL-90-R was confirmed on the item level and the sub-scale level. The results of PCA demonstrated that all 90 items and all 10 sub-scales loaded significantly in one general factor. According to Kline, to indicate an optimal condition for factor analysis, the ratio between the sample size and the number of items in a questionnaire should approach 10:1\(^{30}\). As the sample of this study included only 227 cases, CFA was not conducted.

According to the results of this study, less than a quarter of Kat chewers suffer from hostility (23.529%), and (20.588%) suffer from anxiety and phobic-anxiety (19.41%), while more than 15% of this group suffer from interpersonal sensitivity (18.23%), psychoticism (18.23%), somatization (17.647%), obsession-compulsive (17.058%) or depression (15.88%). Less than 15% of Kat chewers suffer from paranoid ideation (12.35%).

These high prevalence rates of mental disorders mean that Kat stimulates specific psychological disorders among Kat chewers. Odenwald and his colleagues\(^{31}\) found that the individual “with PTSD used Kat more frequently”.

The results of the current study show significant differences between Kat chewers and non-chewers in the nine mental disorders as assessed by SCL-90-R. Chewers have high means in all 10 sub-scales, and the chewers who use Kat four or five times per week have high scores in hostility compared with those who use Kat once or twice per week. Those who chew Kat every day have high scores in psychoticism and hostility compared with those who use Kat once or twice a week.

Some authors found a higher intake of Kat among Kat chewers with PTSD. Paranoia was most frequent among excessive Kat chewers with PTSD, and “the amount of Kat use appeared to be a mechanism, by which paranoia is caused”\(^ {31}\). In contrast to these results, Numan (2004) indicated no significant differences between Kat chewers and non-chewers in terms of mental disorders\(^ {32}\).

**Conclusion**

SCL-90-R has high internal consistency and good construct validity. Males chewing Kat are more likely to become mentally ill, and SCL-90-R could be a useful tool for diagnosing several mental disorders in Kat chewers. So, according to the results of this study, there is a need to explore with different samples the factorial structure of SCL-90-R. We recommend further research to examine the reliability and validity of SCL-90-R in community samples and raising Yemenis' awareness of the dangers that Kat chewing poses to mental health. The researcher recommends evaluating whether the patients who are visiting the psychiatric clinics are taking Kat or not, and the effect of their use on the severity of their psychological disorder, especially in Yemen and Saudi Arabia, where the use of Kat is prevalence. We also recommend further studies on the effect of Kat on mental health in clinical samples.

**Limitations of the Study**

- The sample size in this study is relatively small.
We were unable to apply the tools of this study to a sample of women because they were embarrassed to admit that they were taking Kat.

**Funding**

This study was personally funded without governmental or non-governmental funding in any form.

**Conflict of Interest**

The author declared no conflict of interests.

**Acknowledgment**

I am grateful to Dr. Kay Mach (of King Saud University) and www.cperfection.com for his linguistic review of the manuscript of this study.

**References**

Fadhel Kat Use and Mental disorders as Assessed by the Symptom CL-90 Revised

Glycemic Control among Patients with Type 2 Diabetes Mellitus attending the Medical Clinics of Qassim University: Where are we from the Targets?

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Abstract

Background: Diabetes mellitus (DM) is a chronic disease that requires continuing medical care to prevent complications through proper glycemic control. However, the prevailing poor glycemic control leads to severe morbidities. What is the extent of the glycemic control among our patients requires continuous surveillance.

Objectives: To estimate the changes in the target glycemic control indices among adults with type 2 DM attending the medical clinics of Qassim University, Buraidah, Saudi Arabia, as compared to the international targets and their clinical reflection.

Methods: A cross-sectional design was conducted in January 2017 on type 2 diabetes attending the medical clinics of Qassim University. All adult patients who had an active electronic file and had HbA1c measured were included. A structured abstraction sheet was used to collect the data.

Results: Among the 211 patients included, 46.3% had controlled glycemic control (HbA1c <7%). Diabetes was more likely to be poorly controlled as the number of diabetic medications increased. LDL-cholesterol goal of <100 mg/dL was achieved by 59.4% of the patients. Blood triglyceride levels ≥150 mg/dL were found in 57.3% of patients, while approximately half of the patients achieved the target of HDL-cholesterol (≥40 mg/dL for male and ≥50 for female). The difference in diabetes mellitus control in family medicine clinics versus internal and endocrinology settings were not significantly different, except that HDL-C level which was better among patients in the family medicine clinic.

Conclusion: Relative to previous studies, an improvement of glycemic control among patients with diabetes was observed in this study. Further efforts should be made to boost the ongoing improvement in glycemic control and other outcomes of diabetes care towards the acceptable international standards.

Keywords: Type 2 Diabetes Mellitus, Glycemic control, HbA1c, Qassim University.

Citation: Al-Rasheedi AAS. Glycemic Control among Patients with Type 2 Diabetes Mellitus attending the Medical Clinics of Qassim University: Where are we from the targets? AUMJ, 2017 March 1, 4(1):31-38.
Introduction

Diabetes mellitus (DM) has become a major cause of mortality and disability worldwide. DM is a chronic disease that requires continuing medical care to prevent acute complications, such as hypoglycemic attacks and to reduce the incidence of long-term complications. DM the most common non-communicable diseases in most countries and, unfortunately, continues to increase in prevalence and significance, as modern lifestyles lead to a more sedentary lifestyle, and increased overweight and obesity. About 425 million people suffer from diabetes in the World and the number is expected to increase to 629 million in 2045.

The prevalence of type 2 DM appears to be higher in countries of the Arabic Gulf compared to the global average prevalence. Based on a study in 2009, the prevalence of Type 2 DM in Saudi Arabia was found to be 30%[3], which is higher than the 23.7% reported in 2003[4]. The rapid socio-economic development of these countries has contributed to this high rate of prevalence[3]. The Middle East region is soon expected to have the highest prevalence of DM. As an example, there was a 10% increase in the number of diabetic patients among adults in Qatar from 37,000 in 2006 to 122,000 in 2012[5].

To reduce and probably prevent the long-term complications of diabetes and to improve the quality of life of the patients, proper glycemic control should be achieved. Attainment of other non-glycemic management targets (e.g., blood pressure, lipids, others) is also important. The American Diabetes Association (ADA) regards hemoglobin A1c (HbA1c) as the best criteria of glycemic control; less than 7% HbA1c is proposed as optimal glycemic control[6]. Unfortunately, poor glycemic control (HbA1c ≥7%) is present in a high proportion of patients, despite advances in all fields of medicine[7–10].

This study aimed to identify the changes in the glycemic control indices compared to ADA targets and its clinical reflections among adult patients with type 2 DM attending the medical clinics of Qassim University (QU), Buraidah, Saudi Arabia.

Patients and Methods

Design:

A cross-sectional design was used in this study. Patients with type 2 DM being treated at the medical clinics of QU were identified and followed-up using the electronic health records. The study was conducted in January 2017. Inclusion criteria included adults with type 2 DM who have an active electronic health record and whose HbA1c was tested within the past 3 months. Exclusion criteria were pregnant women and patients suffering from any hemoglobinopathy.

Data Collection and Sample size:

Using the electronic health record at QU clinics, all records were viewed to identify qualifying patients. A structured abstraction sheet was used to collect data. The study included all diabetic patients qualified. The abstraction data sheet included record number, age, gender, nationality, other health problems/diseases, medications and the specialty department providing the diabetes care. HbA1c level and other non-glycemic targets were also recorded.

Outcome definitions:

The level of diabetes control was defined according to the ADA criteria[10] to be: HbA1c <7%, total cholesterol <200 mg/dL, LDL-cholesterol <100 mg/dL, triglycerides <150 mg/dL, HDL-cholesterol in males ≥40 mg/dL and in females ≥50 mg/dL, systolic blood pressure (SBP) <140 mmHg and diastolic blood pressure (DBP) <90 mmHg.

Ethical consideration:

All collected information was kept confidential and data were anonymously recorded. Each patient's record was given a code number on the study documents, so all data were concealed from all study participants except for the principal investigator. This research was approved by the regional research ethics committee of Qassim region.

Data management:

Statistical Package for Social Sciences (SPSS, version 21) was used for data
analysis. Data were described using mean ± standard deviation (SD) for continuous variables and proportions for categorical variables. Chi-square test was used to assess the statistical significance of the difference in the percentages of glycemic control according to categorical variables. Comparison of the mean levels of HbA$_1c$, fasting blood glucose (FBS), triglycerides, total cholesterol, HDL-cholesterol, LDL-cholesterol and blood pressure among patients attending family medicine (FM) clinics was compared to those attending the internal medicine/endocrinology clinics using the student’s unpaired t-test. A P value <0.05 was considered statistically significant.

**Results**
A total of 211 patients with type 2 DM were included in this study. Approximately 46.3% of patients with type 2 DM had controlled glycemic control (HbA$_1c$ <7%). The mean HbA$_1c$ was 7.38 ± 1.59%, ranging from 4.4-13.4%. The average age of patients was 55 ± 9.5 years, ranging from 31 - 88 years and females constituted only 35.5% of the included patients.

### Table 1: The frequency of study variables for diabetic patients stratified for % of HbA$_1c$.

<table>
<thead>
<tr>
<th>Study variables</th>
<th>n (%)</th>
<th>HbA$_1c$ &lt;7%</th>
<th>HbA$_1c$ ≥7%</th>
<th>*P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥65 years</td>
<td>106 (50.2)</td>
<td>55.6</td>
<td>44.4</td>
<td>0.418</td>
</tr>
<tr>
<td>55–64 years</td>
<td>78 (37)</td>
<td>48.7</td>
<td>51.3</td>
<td></td>
</tr>
<tr>
<td>&lt;55 years</td>
<td>27 (12.8)</td>
<td>42.5</td>
<td>57.5</td>
<td></td>
</tr>
<tr>
<td>Gender: Male/Female</td>
<td>136 (64)/75 ((35)</td>
<td>44.9/49.3</td>
<td>55.1/50.7</td>
<td>0.532</td>
</tr>
<tr>
<td>Nationality: Saudi/Non-Saudi</td>
<td>98 (46.5)/113 (53.6)</td>
<td>45/47.8</td>
<td>55/52.2</td>
<td>0.675</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>70 (33.2)</td>
<td>42.9</td>
<td>57.1</td>
<td>0.493</td>
</tr>
<tr>
<td>1 disease</td>
<td>92 (43.6)</td>
<td>51.1</td>
<td>48.9</td>
<td></td>
</tr>
<tr>
<td>≥2 diseases</td>
<td>49 (23.2)</td>
<td>42.9</td>
<td>57.1</td>
<td></td>
</tr>
<tr>
<td>Specialty providing the care:</td>
<td></td>
<td></td>
<td></td>
<td>0.910</td>
</tr>
<tr>
<td>Family medicine</td>
<td>161 (76.3)</td>
<td>47.2</td>
<td>52.8</td>
<td></td>
</tr>
<tr>
<td>Internal medicine</td>
<td>26 (12.3)</td>
<td>42.3</td>
<td>57.7</td>
<td></td>
</tr>
<tr>
<td>Endocrinology</td>
<td>24 (11.4)</td>
<td>45.8</td>
<td>54.2</td>
<td></td>
</tr>
<tr>
<td>SBP: &lt;140/≥140 mmHg</td>
<td>145 (68.7)/66 (31.3)</td>
<td>49/42.4</td>
<td>51/57.6</td>
<td>0.404</td>
</tr>
<tr>
<td>DBP: &lt;90/≥90 mmHg</td>
<td>176 (83.4)/35 (16.6)</td>
<td>48.3/40</td>
<td>51.7/60</td>
<td>0.386</td>
</tr>
<tr>
<td>Diabetic Medications:</td>
<td></td>
<td></td>
<td></td>
<td>0.000</td>
</tr>
<tr>
<td>One medication</td>
<td>67 (31.8)</td>
<td>68.7</td>
<td>31.3</td>
<td></td>
</tr>
<tr>
<td>2 medications</td>
<td>84 (39.8)</td>
<td>39.3</td>
<td>60.7</td>
<td></td>
</tr>
<tr>
<td>3 or more</td>
<td>60 (28.4)</td>
<td>31.7</td>
<td>68.3</td>
<td></td>
</tr>
<tr>
<td>Fasting blood glucose: &lt;130/≥130 mg/dL</td>
<td>56 (30.8)/126 (69.2)</td>
<td>91.1/25.4</td>
<td>8.9/74.6</td>
<td>0.000</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td></td>
<td></td>
<td></td>
<td>0.926</td>
</tr>
<tr>
<td>&lt;200 mg/dL</td>
<td>82 (42.7)</td>
<td>46.1</td>
<td>53.9</td>
<td></td>
</tr>
<tr>
<td>200-239 mg/dL</td>
<td>46 (24)</td>
<td>48.6</td>
<td>51.4</td>
<td></td>
</tr>
<tr>
<td>&gt;240 mg/dL</td>
<td>64 (33.3)</td>
<td>40</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>HDL in Males: ≥40/≤40 mg/dL</td>
<td>53 (49.5)/54 (50.5)</td>
<td>49.1/42.6</td>
<td>50.9/57.4</td>
<td>0.317</td>
</tr>
<tr>
<td>HDL in Females: ≥50/≤50 mg/dL</td>
<td>36 (56.3)/28 (43.8)</td>
<td>41.7/53.6</td>
<td>58.3/46.4</td>
<td>0.244</td>
</tr>
<tr>
<td>LDL-Cholesterol: &lt;100/≥100 mg/dL</td>
<td>104 (59.4)/71 (40.6)</td>
<td>49/45.1</td>
<td>51/54.9</td>
<td>0.359</td>
</tr>
<tr>
<td>Triglyceride:</td>
<td></td>
<td></td>
<td></td>
<td>0.649</td>
</tr>
<tr>
<td>&lt;150 mg/dL</td>
<td>82 (42.7)</td>
<td>48.8</td>
<td>51.2</td>
<td></td>
</tr>
<tr>
<td>150-199 mg/dL</td>
<td>46 (24)</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>≥200 mg/dL</td>
<td>64 (33.3)</td>
<td>42.2</td>
<td>57.8</td>
<td></td>
</tr>
</tbody>
</table>

*Chi-square test.*
Table 2: The anti-diabetic medications used stratified for % of HbA1c.

<table>
<thead>
<tr>
<th>Anti-diabetic Medication</th>
<th>HbA1c &lt;7 n (%)</th>
<th>HbA1c ≥7 n (%)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metformin: Yes/No</td>
<td>90 (48.6)/8 (30.8)</td>
<td>95 (51.4)/18 (69.2)</td>
<td>0.087</td>
</tr>
<tr>
<td>Sulfonylurea: Yes/No</td>
<td>40 (36.7%)/58 (56.9%)</td>
<td>69 (63.3%)/44 (43.1%)</td>
<td>0.003</td>
</tr>
<tr>
<td>DPP-4 inhibitors: Yes/No</td>
<td>24 (32.9)/74 (53.6%)</td>
<td>49 (67.1%)/64 (46.4%)</td>
<td>0.003</td>
</tr>
<tr>
<td>Insulin: Yes/No</td>
<td>9 (23.7%)/89 (51.4%)</td>
<td>29 (76.3%)/84 (48.6%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Other drugs: Yes/No</td>
<td>2 (25%)/96 (47.3%)</td>
<td>6 (75%)/107 (52.7%)</td>
<td>0.191</td>
</tr>
</tbody>
</table>

*Chi-square test. Dipeptidyl peptidase 4 = DPP-4

With regard to the medical specialties providing the care for the diabetic patients, family medicine (76.3%) was the major, while internal medicine and endocrinology accounted for 12.3% and 11.4% of the patients, respectively. Approximately one-third of the patients had no comorbidity while 23.2% suffered from two or more other diseases. Hypertension and dyslipidemia constituted about 36% and 42.2% of the comorbidities, respectively.

Table 1 shows the proportion of the glycemic control according to the study variables. The most frequently used anti-diabetic medication was metformin (88%), followed by sulfonylureas (Table 2). Table 3 shows the frequency of the use of other medications. About non-glycemic criteria, 68.7% and 83.4% achieved the target of systolic blood pressure (<140 mmHg) and diastolic blood pressure (<90 mmHg), respectively. The LDL-C goal of <100 mg/dL was achieved by 59.4% of the patients. Blood triglyceride levels of ≥150mg/dL were found in about 57.3%. Approximately half of the patients have achieved the target of HDL-cholesterol (>40 mg/dL for male and >50mg/dL for female; Table 4).

Table 3: Frequency of the use of other medications.

<table>
<thead>
<tr>
<th>Medication</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statins</td>
<td>37.9</td>
</tr>
<tr>
<td>Aspirin</td>
<td>32.7</td>
</tr>
<tr>
<td>Vitamins</td>
<td>23.7</td>
</tr>
<tr>
<td>Angiotensin receptor blockers</td>
<td>20.9</td>
</tr>
<tr>
<td>Angiotensin-Converting Enzyme Inhibitors</td>
<td>16.6</td>
</tr>
<tr>
<td>Beta-blockers</td>
<td>15.2</td>
</tr>
<tr>
<td>Thiazide</td>
<td>13.3</td>
</tr>
<tr>
<td>Calcium Channel Blockers</td>
<td>12.3</td>
</tr>
<tr>
<td>Fenofibrates</td>
<td>11.4</td>
</tr>
<tr>
<td>Other medications*</td>
<td>23.7</td>
</tr>
</tbody>
</table>

*They include proton pump inhibitor, escitalopram and thyroxin.

Table 4: Comparing the means of the study variables among patients served at the family medicine (FM) vs. internal medicine/endocrinology (Int. M/Endo) clinics. Data shown are Mean ± SD.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>FM Clinic</th>
<th>Int. M/Endo Clinic</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>55.12 ± 9.84</td>
<td>53.41 ± 8.52</td>
<td>0.267</td>
</tr>
<tr>
<td>HbA1c</td>
<td>7.31 ± 1.56</td>
<td>7.61 ± 1.69</td>
<td>0.23</td>
</tr>
<tr>
<td>Fasting blood glucose</td>
<td>158.56 ± 52.52</td>
<td>176.6 ± 35.51</td>
<td>0.82</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>178 ± 86.6</td>
<td>184 ± 71.9</td>
<td>0.689</td>
</tr>
<tr>
<td>Total-Cholesterol</td>
<td>168 ± 41.03</td>
<td>171.69 ± 35.51</td>
<td>0.596</td>
</tr>
<tr>
<td>LDL-C</td>
<td>89.43 ± 86.60</td>
<td>96.19 ± 71.90</td>
<td>0.254</td>
</tr>
<tr>
<td>HDL-C</td>
<td>45 ± 12.09</td>
<td>39.39 ± 10.51</td>
<td>0.010</td>
</tr>
<tr>
<td>SBP</td>
<td>129.14 ± 17.12</td>
<td>125.96 ± 17.52</td>
<td>0.252</td>
</tr>
<tr>
<td>DBP</td>
<td>77.83 ± 8.59</td>
<td>78.47 ± 8.28</td>
<td>0.691</td>
</tr>
<tr>
<td>Blood urea nitrogen</td>
<td>14.56 ± 6.38</td>
<td>12.95 ± 3.75</td>
<td>0.103</td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.78 ± 0.25</td>
<td>0.79 ± 0.24</td>
<td>0.866</td>
</tr>
</tbody>
</table>

Student unpaired t-test. SBP and DBP = Systolic and diastolic blood pressure.
Discussion

Successfully managing diabetes is important to reduce the risk of long-term complications and to improve the quality of life. The proportion of good glycemic control (HbA1c <7%) among patients with type 2 DM at medical clinics of QU was 46.3%, which is better than has been reported in other studies in Saudi Arabia. Only 29.9–33.3% of patients with type 2 DM had good glycemic control at the Primary Care Center (PCC) of King Khalid University Hospital (KKUH) in 2012-20137,11, while this value was around 25% in 200612. At Al-Madinah Diabetic Center in 2012, the proportion of good glycemic control was much lower (23.6%)13. In another research paper which represented data collected from 28 health centers all over Saudi Arabia, only 27% of patients reached the target HbA1c14. In one study done at primary healthcare centers (PHCs) in Jazan in Saudi Arabia, the rate of poor glycemic control was higher (74%) than reported here15. Surprisingly, the rate of controlled diabetic (HbA1c <7%) was very low (12.5%) based on the study done at King Abdul-Aziz Medical City, National Guard (NG), Riyadh in the period from May 2013 to December 201416. In another study, also done at NG in Riyadh, the results were also poor, in which the mean of HbA1c levels were 9.04 and 8.61% in community diabetic centers and primary healthcare centers, respectively17. The 5-year management of diabetic patients in NG between 2011and 2015 did not show improvement in HbA1c at both centers17.

In the countries of the Arabic Gulf, the rate of good glycemic control ranges from 11 -41%18, which is lower than in this study. Inadequate control of diabetes was reported in Iran in which the mean level of HbA1c was 8.56% and only 31.66% of men and 26% of women had controlled HbA1c18. In Canada, the results seem to be slightly better when compared to our results. Among 5123 patients with type 2 DM seen on a single day on or around World Diabetes Day2012, approximately half of the patients achieved HbA1c ≤7.0%19. Based on a cross-sectional PANORAMA study, the poor glycemic control in European patients with type 2 DM was estimated to be 37.4% (ranging from about 25.9% in The Netherlands to 52% in Turkey)20. On the other hand, the rate of poor glycemic control was higher than most recent studies, in which approximately more than two-thirds (70.9%) of adults with type 2 DM attending the Teaching Hospitals in Ethiopia had HbA1c >7%21.

The rate of blood pressure control and serum lipid targets in this study was better when compared to the situation at PHCs in Jazan15. The proportion of non-glycemic targets was similar to those results reported in Riyadh11. In the PCC of KKUH and the diabetic center of King Abdulaziz University Hospital (KAUH), around 81%, 53.6%,54.3%, 68.4% and 60% had the optimal goal for total cholesterol, LDL-C, HDL-C in males, HDL-C in female and triglyceride levels, respectively. 28.4% and 72% had controlled SBP and DBP, respectively11. In Iran, the rate of achieving lipid targets was found to be less than the present study18.

The glycemic control was significantly more likely to be poor with the use of insulin, sulfonylureas, and dipeptidyl peptidase 4 (DPP-4) inhibitors, but not with the use of metformin. In the present study, patients with poor glycemic control were more likely to be prescribed a combination of oral hypoglycemic agents and insulin, which might indicate that physicians are attempting multiple therapies to provide better disease control. The finding of an association between treatment with combination of oral hypoglycemic agents and insulin and poor glycemic control is consistent with many other studies1,2,22,23. This finding could reflect the fact about deteriorations of diabetes over time, and the increasing need for multiple medications over time. On the other hand, age, gender, nationality, and the presence of other comorbidity did not affect the glycemic control that is compatible with some studies7,10,11.

Regarding the difference in DM control in family medicine clinic versus internal and endocrinology settings, there was no significant difference between these
settings except that HDL-C was significantly higher among patients attending family medicine clinics. This finding is consistent with those results that compared the situation between PCC of KKUH and the diabetic center of KAUH, except that LDL-C and HDL-C levels were better in the diabetic center\(^{(11)}\). Here, present study detected no significant difference in the glycemic control between FM and other clinics. This finding is similar to some studies\(^{(16)}\), but not with others\(^{(11,24,25)}\). As an example, glycemic control at PCC of KKUH was better than the results seen in the diabetic center of KAUH\(^{(11)}\).

To our knowledge, this study was the first study conducted to assess the level of glycemic control at the medical clinics of QU and probably the first research at the medical clinics of QU. However, this study is cross-sectional. Also, a few cases of pre-diabetes might have been included, since prediabetes cases could be labeled as diabetes in the electronic file. This could explain the high rate of good glycemic control.

**Conclusion**

Improvement of glycemic control among patients with diabetes was observed in this study, as compared to previous studies. More effort should be carried out to ensure ongoing improvement in glycemic control and other outcomes used in diabetes care. A further study at the medical clinics of QU that examines both patients and physicians for causes of uncontrolled diabetes; patients' compliance and as well as adherence to guidelines, is encouraged.

**Limitations of the Study**

- The data were extracted from a single healthcare setting, so the findings cannot be generalized.
- Some cases of pre-diabetes might have been included, since pre-diabetes cases could be labeled as diabetes in the electronic file.

**Funding**

The whole budget was funded by the researcher himself.

**Conflict of Interest**

The author declared no conflict of interests.

**References**


Case Report

Abdominal Cocoon: A Case Report and a Literature Review

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Abstract

Background: Peritoneal encapsulation is an infrequently described problem that leads to formation of an accessory peritoneal membrane. The sclerosing encapsulating peritonitis (SEP) form of the disease is a very rare cause of intestinal obstruction. SEP is characterized by formation of fibro-collagenic cocoon like sac that surrounds the small bowel. It is not easy to make a solid diagnosis pre-operatively. It is a developmental disease with longstanding symptoms of partial bowel obstruction and abdominal mass before the onset of acute obstructive episode.

Case Description: We have treated a 21-year-old male patient with small bowel (abdominal) cocoon. The patient came to the hospital showing manifestations of acute small bowel obstruction associated with abdominal mass. There was no history of previous surgery or peritonitis. CT scan revealed characteristic findings of small bowel loops congregated to the pelvi-abdominal region encased by a sac-like soft-tissue thick membrane. A diagnosis of an abdominal cocoon was incidentally intraoperative. Intraoperative adhesion-lysis of the small bowel and excision of the covering membrane were required. No complications or recurrence were described in the 2-year period of post-operative follow-up of our case.

Conclusion: A better understanding of the clinical criteria of small bowel cocoon may facilitate preoperative diagnosis particularly combined with help from abdominal CT scan as the best imaging modality. Such information help prevents inadvertent bowel damage intraoperatively and unnecessary bowel resection.

Key words: Abdominal cocoon, Sclerosing encapsulating peritonitis, Adhesive small bowel obstruction, Peritoneal encapsulation.


Introduction

The sclerosing encapsulating peritonitis (SEP) is an uncommon chronic syndrome. Clinically, the syndrome is usually presented as intermittent, acute or sub-acute gastrointestinal obstruction⁰. It is one of the rare causes of intestinal obstruction and characterized by a thick grayish-white fibrotic membrane encasing the small bowel⁴. It commonly presents with nonspecific abdominal pain of chronic and vague nature. It may be associated by weight loss. It is difficult to be recognized clinically until the patient develops symptoms of bowel obstruction⁴. The actual incidence of peritoneal encapsulation syndrome is higher as asymptomatic cases are unlikely to be reported.⁵⁰ It was first termed as peritonitis chronic fibrosain capsulata by Owtschinnikow in 1907 and finally abdominal cocoon by Foo in1978⁵⁰. Considering the two forms of SEP, the primary form, with currently unknown cause, is also called as idiopathic and as abdominal cocoon syndrome⁵⁰. On the
other hand, many conditions and causes are implicated in the secondary form of SEP; the most common is peritoneal dialysis. The disease may be secondary to various conditions. These include prior abdominal surgery or peritonitis, tuberculosis, ventriculo-peritoneal shunt, cirrhosis, use of drugs like propranolol, etc.

Reportedly, cases diagnosed as abdominal cocoon are few. This condition usually a disease affects small bowel. More common in tropical and subtropical countries, the adolescent girls are more prone to be diagnosed with the abdominal cocoon. Laterally, the peritoneal membrane of abdominal cocoon is secured to the ascending and descending colon. The transverse mesocolon secures it cranially. At the caudally aspect, abdominal cocoon is held by the posterior parietal peritoneum. The upper opening of the abdominal cocoon is the entrance for the intestine that locates to the duodenojejunal junction. The lower opening of the abdominal cocoon, where the last loop exits, locates to the ileocecal junction. Whereas SEP is characterized by sclerosis, it is absent in the abdominal cocoon. In the latter, the encapsulating membrane covering the intestine is only a layer of serosa membrane like the peritoneum.

Preoperative diagnosis is troublesome and difficult and most of the cases are diagnosed only during the operation. The best treatment is extensive lysis of the adhesions with membrane dissection. With the advances in the imaging techniques preoperative diagnosis of this condition became possible. It is characterized by a cauliflower sign on barium contrast study with serpentine dilatation of the small bowel loop in a fixed U-shaped cluster. In the present case a similar appearance was noted on CT scan which has been reported earlier. We have treated a case of small bowel (abdominal) cocoon who presented with acute small bowel obstruction associated with pelvi-abdominal mass like a gravid uterus. There was no history of previous surgery or peritonitis, but the patient was treated as a nephrotic syndrome for 6 years and treated as renal failure in the last three months by regular hemodialysis.

**Case Description**

A 21-year-old male patient, referred from nephrology unit of our hospital (Al-Zahraa University Hospital, Al-Azhar University, Cairo, Egypt) August 2013, with a 2-days history of severe colicky abdominal pain and vomiting, but without constipation. He had similar symptoms 4 months before, and since this time he had felt an almost constant dull ache in the epigastrium associated with post-prandial distress. He consented for the anonymous reporting of his case. Such reporting was also approved by our local bioethical committee.

On physical examination, he was earthy look, mildly dehydrated, with normal oral and rectal temperatures. He had a pulse rate of 82/min, a respiratory rate of 20 cycle/min and a blood pressure of 110/80 mmHg. The positive findings were confined to the abdomen, which was mildly distended, lax, with epigastric tenderness, pelvi-abdominal mass and hyperactive, metallic bowel sounds. Rectal examination yielded normal results.

Laboratory investigations showed hemoglobin level of 7.6 g/dL, white cell count of 14 x 10^9/mL, RBCs of 3.7 x 10^12/L, platelets count of 506 x 10^9/mL, prothrombin time of 14.2 sec (PC of 70% and INR of 1.22), serum sodium of 140 mmol/L, serum potassium of 4.2 mmol/L, blood urea of 92 mg/dL, serum creatinine of 5.6 mg/dL, FBS of 98 mg/dL, SGOT of 30 U/L, SGPT of 30 U/L, serum total bilirubin of 0.6 mg/dL and serum albumin of 3.2 g/dL.

Chest radiographs revealed right minimal pleural effusion with consolidation of lower zone of right lung (Figure 1A), but supine abdominal X-ray revealed dilated loops of small bowel with an obstructed pattern, and, erect X-ray revealed a multiple air fluid levels (Figure 1B). Abdominal ultrasonography revealed pelvi-abdominal thick-walled mass containing bowel loops, with small amount of fluid inside and mild ascites. Congregation of small bowel loops to the lower abdomen and pelvis, encased by a
thick white membrane, was the characteristic finding in abdominal CT scan (Figure 2A and B) along with right minimal pleural effusion with consolidation collapse of lower zone of right lung revealed by chest CT (Figure 3).

![Figure 1: A) Chest plain X-ray showing minimal pleural effusion with consolidation of lower zone of right lung. B) Abdominal plain X-ray erect revealed a multiple air fluid levels.](image1)

![Figure 2: A) Enhanced and B) Non-enhanced CT abdominal scan, both are showing the characteristic findings; the small bowel loops congregated and encased by thick white membrane.](image2)

![Figure 3: CT chest revealed right minimal pleural effusion with consolidation collapse of lower zone of right lung.](image3)

At operation a mid-line incision was made through the abdominal wall. An opaque membrane was present which did not adhere to the anterior abdominal wall. The membrane appeared to be a large opaque cystic mass and small bowel was apparently absent but large bowel was visible around the sac. On incision of the membrane, a small amount of yellowish fluid escaped, and edematous adherent loops of small bowel appeared. At the upper opening just below the duodenojejunal junction, where the small bowel entered the sac, obstruction was caused by the markedly thickened edge of the sac. The gastric distension was rapidly collapsed after the release of the edge of the sac. The entire colon was collapsed. The whole cystic formation was completely removed and the duodenojejunal junction liberated. Few hours after adhesiolysis and removal of the sac our patient was submitted to theater again for refashioning of the A-V shunt because of impending rupture. Postoperatively the patient recovered well, his bowel was normal, and all other symptoms were relieved. Our patient was discharged 7 days after the operative. He was sent to nephrology unit to continue hemodialysis because of pre-existing
renal failure. On early follow-up he was free of intestinal obstruction symptoms.

Discussion

Abdominal cocoon; sclerosing and non-sclerosing, is only reported case reports because of its rarity. Such deficiency of compiled literature resulted in largely undefined epidemiology\(^{(13)}\). The different frequently wrongly used definitions are a main issue in the interpretation of the different forms of the peritoneal encapsulation and the sclerosing encapsulating peritonitis (SEP). The only solution for such confusion for the differential diagnosis comes from the standard pathological examination of the membranes samples\(^{(12)}\). Although they are three distinct pathological entities, the three terms; peritoneal encapsulation, abdominal cocoon and SEP, are erroneously used interchangeably. Most commonly, abdominal cocoon presents in young girls in tropical regions with acute or chronic bowel obstruction\(^{(14)}\). SEP is characterized by a thick, white, fibrous membrane covering the small bowel\(^{(15)}\). Similar to our case, the latter case was a rare complication of chronic ambulatory peritoneal dialysis and the use of adrenergic blocker protocol\(^{(15)}\).

Globally, the number of the reported cases is few. SEP is identified in the literature as abdominal cocoon. Pathologically it is characterized by formation of a fibro-collagenic membrane encasing the bowel\(^{(11)}\). Small bowel is the commonly involved organ, but other organs as large intestine, liver and stomach can be involved\(^{(16)}\).

SEP can be idiopathic or secondary\(^{(17)}\). The disease conditions that leads to the development of secondary SEP are exemplified by beta-blocker treatment, recurrent peritonitis, systemic lupus erythematosus, intraperitoneal povidone-iodine use, abdominal surgery, abdominal tuberculosis, peritoneal dialysis, liver transplantation, and parasitic infection with potential granulomatous peritonitis\(^{(13)}\). However, the underlying pathogenesis is not fully understood\(^{(18)}\).

Since abdominal cocoon is not diagnosed till the time of exploration in operating room, various imaging modalities are helpful to intensify vigilance for the possibility of the condition. To begin with, dilated small bowel segments, the thickening of the peritoneal membrane in case it is sufficiently thickened and free fluid collection, will be demonstrated by abdominal sonography. Secondly, a concertina pattern or cauliflower sign along with delayed transit of contrast medium will be revealed by Barium follow-through. Thirdly, capsulated intestinal loops covered by thickened peritoneum and mesentery would be shown by CT, as the best imaging modality for such diagnostic purpose\(^{(17)}\). Along with the thickening of the peritoneum, peritoneal enhancement and peritoneal calcification, small bowel tethering, and loculated fluid collections are also revealed by CT scan\(^{(18)}\).

A better awareness of this entity and imaging techniques may facilitate pre-operative diagnosis\(^{(19)}\). If the symptoms of intestinal obstruction are associated with an abdominal lump which shows the characteristic serpentine configuration of the dilated small bowel within cocoon upon the contrast follow-through, a preoperative diagnosis may be suspected\(^{(14)}\). The present case was diagnosed as abdominal cocoon incidentally intraoperative, and, preoperative diagnosis was difficult despite proper investigations because of the rarity of this case. The treatment of choice in this case is surgical management namely, adhesolysis and membrane dissection. When an early preoperative diagnosis is feasible at proper time, the need for bowel resection is usually aborted. Unless during exploration there is non-viable bowel, the unnecessary bowel resection increases the risk of morbidity and mortality. Recovery is satisfactory achieved by releasing of the small intestine through dissecting and excising of the encasing membrane. A remarkable long-term postoperative prognosis is guaranteed most for the cases\(^{(20,21)}\). In our case, we excised the covering membrane and the dense inter-bowel adhesions. The small bowel was viable, so bowel resection was not required in this case. The reported surgical complications included perforated bowel, entero-cutaneous fistula and intra-abdominal infections\(^{(22)}\). During
the period of 2-years post-operative follow-up, no recurrence or complication were observed, and our patient did not require repeating the adhesiolysis. However, asymptomatic SEP does not require surgical treatment \(^{(22)}\).

**Conclusion**

Our case belongs to the rare abdominal cocoon/SEP entity that is difficult to definitely pre-operatively diagnosis. It highlights the importance of considering the possibility of abdominal cocoon/SEP in the pre-operative diagnosis. The challenges in diagnosing abdominal cocoon/SEP can be overcome through high index of clinical suspicion due to the recurrent episodes of small intestinal obstruction and lack of other plausible etiologies combined with imaging finding; especially CT scan. Surgery is important in the management of abdominal cocoon/SEP. Careful dissection and excision of the thick sac with the release of the small intestine leads to complete recovery as seen in our case.

**Conflict of Interest**

The authors declared no conflict of interests.

**Reference**


INTRODUCTION

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Original Research Communications may be offered as Full Papers, as Short Communications or as Short research Paper. The latter format is recommended for presenting technical evaluations and short clinical notes, comprising up to 1,500 words of text, 15 references, and two illustrative items (Tables and/or Figures).

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This should explore the significance, interpretation and reasoning of the results of the work vs. other studies. Do not repeat describing the results in this section. A combined Results and Discussion section is acceptable. Avoid extensive citations and discussion of published literature. In the same time, avoid speculations without a supporting literature. Avoid discussion based on "Data not Shown" or "Personal Communications".

**Limitations and Future Prospective**

The authors may wish to pinpoint the limitations of the study and their reason and foresee the next step to go from their study. This may be presented in a short Limitations and Future Prospective section standing alone or as a separate paragraph in the Discussion or Results/Discussion section.

**Conclusions**

The main conclusions of the study may be presented in a short Conclusions section standing alone or as a separate paragraph at the end of the Discussion or Results/Discussion section. Conclusions should not be biased and should be based on the data, presented and discussed inside the manuscript only.

**Gain of Knowledge**

Following the conclusion section, it is mandatory for manuscripts submitted for final publication in AUMJ to have a Gain of Knowledge section that is consisted of 2 - 5 bullet points (maximum 90 characters, including spaces, per bullet point) that convey the core findings of the article.

**Acknowledgements and Funding**

Collate acknowledgements in a separate section at the end of the article before the references. List individuals or organizations that provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.). Whoever would
be acknowledged should be informed and a verification for that could be requested by AUMJ Editor. If funded, the source of funding should be mentioned.

**Appendices**

If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

**CASE REPORT WRITING TEMPLATE**

**Title.** Include the words “case report” in the title. Describe the phenomenon of greatest interest (e.g., symptom, diagnosis, diagnostic test, intervention, and outcome).

**Abstract.** Summarize the following information if relevant: 1) Rationale for this case report, 2) Presenting concerns (e.g., chief complaints or symptoms, diagnoses), 3) Interventions (e.g., diagnostic, preventive, prognostic, therapeutic exchange), 4) Outcomes, and 5) Main lesson(s) from this case report.

**Key Words.** Provide 3 - 8 key words that will help potential readers search for and find this case report.

**Introduction.** Briefly summarize the background and context of this case report.

**Presenting Concerns.** Describe the patient characteristics (e.g., relevant demographics - age, gender, ethnicity, occupation) and their presenting concern(s) with relevant details of related past interventions.

**Clinical Findings.** Describe: 1) the medical, family, and psychosocial history including lifestyle and genetic information; 2) pertinent comorbidities and relevant interventions (e.g., self-care, other therapies); and 3) the physical examination (PE) focused on the pertinent findings including results from testing.

**Timeline.** Create a timeline that includes specific dates and times (table, figure, or graphic).

**Diagnostic Focus and Assessment.** Provide an assessment of the; 1) diagnostic methods (e.g., PE, laboratory testing, imaging, questionnaires, referral), 2) diagnostic challenges (e.g., financial, patient availability, cultural), 3) diagnostic reasoning including other diagnoses considered, and, 4) prognostic characteristics (e.g., staging) where applicable.

**Therapeutic Focus and Assessment.** Describe: 1) the type(s) of intervention (e.g., preventive, pharmacologic, surgical, lifestyle, self-care) and 2) the administration and intensity of the intervention (e.g., dosage, strength, duration, frequency).

**Follow-up and Outcomes.** Describe the clinical course of this case including all follow-up visits as well as 1) intervention modification, interruption, or discontinuation, and the reasons; 2) adherence to the intervention and how this was assessed; and 3) adverse effects or unanticipated events. In addition, describe: 1) patient-reported outcomes, 2) clinician-assessed and -reported outcomes, and 3) important positive and negative test results.

**Discussion.** Please describe: 1) the strengths and limitations of this case report including case management, 2) the literature relevant to this case report (the scientific and clinical context), 3) the rationale for your conclusions (e.g., potential causal links and generalizability), and 4) the main findings of this case report: What are the take-away messages?

**Patient Perspective.** The patient should share his or her experience or perspective of the care in a narrative that accompanies the case report whenever appropriate.

**Informed Consent.** Did the patient or their custodian give the author of this case report informed consent? Provide if requested.

**Case Report Submission Requirements:** 1) Competing interests, are there any competing interests?, 2) Ethics Approval, Did an ethics committee or institutional review board give approval? If yes, please provide if requested, 3) De-Identification, Has all patient's related data been de-indentified?

**RANDOMIZED CLINICAL TRIALS WRITING TEMPLATE**

In this particular type of original study, individuals are randomly allocated to receive or not receive a preventive, therapeutic, or diagnostic intervention and then followed up to determine the effect of the intervention. All randomized clinical trials should include a flow diagram and authors should provide a completed randomized trial checklist (see CONSORT Flow Diagram and Checklist; http://www.consort-statement.org) and a trial protocol.

Authors of randomized controlled trials are encouraged to submit trial protocols along with their manuscripts.

All clinical trials must be registered (before recruitment of the first participant) at an appropriate online public that must be independent of for-profit interest, e.g.:
- [http://www.clinicaltrials.gov](http://www.clinicaltrials.gov);
- [http://www.anzctr.org.au](http://www.anzctr.org.au);
Each manuscript should clearly state an objective or hypothesis; the design and methods (including the study setting and dates, patients or participants with inclusion and exclusion criteria, or data sources, and how these were selected for the study); the essential features of any interventions; the main outcome measures; the main results of the study; a comment section placing the results in context with the published literature and addressing study limitations; and the conclusions.

Data included in research reports must be original. A structured abstract not exceeding 300 words is required. Clinical trials are limited to 2700 words (not including abstract, tables, figures, and references), 40 references, and no more than 5 tables and figures.

**REVIEW, MINIREVIEW AND META-ANALYSIS PAPERS**

These papers will not have empirical data acquired by the authors but will include historical perspectives, analysis and discussion of papers published and data acquired in a specific area.

Systematic reviews and meta-analyses are a particular type of original articles that perform systematic, critical assessment of literature and data sources pertaining to clinical topics, emphasizing factors such as cause, diagnosis, prognosis, therapy, or prevention. All articles or data sources should be searched for and selected systematically for inclusion and critically evaluated, and the search and selection process should be described in detail in the manuscript. The specific type of study or analysis, population, intervention, exposure, and tests or outcomes should be described for each article or data source. A structured abstract of less than 300 words is required. The text is limited to 3500 words (not including abstract, tables, figures, and references); about 4 tables (a flow diagram that depicts search and selection processes as well as evidence tables should be included) - and no reference limit.

Minireview is a brief historical perspective, or summaries of developments in fast-moving areas covered within the scope of the journal. They must be based on published articles; they are not outlets for unpublished data. They may address any subject within the scope of the journal. The goal of the minireview is to provide a concise very up-to-date summary of a particular field in a manner understandable to all readers.

**SHORT COMMUNICATION AND SHORT RESEARCH ARTICLE**

Short Communications are urgent communications of important preliminary results that are very original, of high interest and likely to have a significant impact on the subject area of the journal. A Short Communication needs only to demonstrate a 'proof of principle'. Authors are encouraged to submit an Original Research Paper to the journal following their Short Communication. There is no strict page limit for a Short Communication; however, a length of 2500-3500 words, plus 2-3 figures and/or tables, and 15-20 key references is advisable. Short Research Article may be smaller single-result findings as a brief summary that include enough information, particularly in the methods and results sections, that a reader could understand what was done.

**POLICY PAPER**

The purpose of the policy paper is to provide a comprehensive and persuasive argument justifying the policy recommendations presented in the paper, and therefore to act as a decision-making tool and a call to action for the target audience.

**COMMENTARIES/OPINION ARTICLES**

An opinion-based article on a topical issue of broad interest, which is intended to engender discussion.

**STUDY PROTOCOLS AND PRE-PROTOCOLS**

AUMJ welcomes publishing protocols for any study design, including observational studies and systematic reviews. All protocols for randomized clinical trials must be registered and follow the CONSORT guidelines; ethical approval for the study must have been already granted. Study pre-protocols (i.e., discussing provisional study designs) may also be submitted and will be clearly labeled as such when published. Study protocols for pilot and feasibility studies may also be considered.

**METHOD ARTICLES**

These articles describe a new experimental or computational method, test or procedure, and should have been well tested. This includes new study methods, substantive modifications to existing methods or innovative applications of existing methods to new models or scientific questions. We also welcome new technical tools that facilitate the design or performance of experiments or operations and
data analysis such as software and laboratory and surgical devices, or of new technologies to assist medical diagnosis and treatment such as drug delivery devices.

**Maximum length of submissions**

*Full length original research articles* should not exceed 10000 words (maximum 60 references), and up to 6 tables and/or figures.

*Short communications* comprising up to 1800 words of text, maximum 15 references, and two illustrative items (Tables and/or Figures).

*Letters and Case Reports* (provide novel insight into disease mechanisms, diagnostic and management applications). *Clinical Laboratory Notes* (technical evaluation or important insight into analytical methodology), or *Letters to the Editor* (focused on a specific article that has appeared in Aljouf Medical Journal within 4 weeks of print issue date of article). For all 3 types of letters listed above, the text should not exceed 600 words, with no abstract, a maximum of 1 table or figure and up to 5 references.

*Review Articles, Surveys, Essays, and Special Reports* may exceed the word and reference limit for Full-length articles as per the comprehensive nature of these articles. However, both of these articles (Reviews and Special Reports) will still require an abstract (unstructured, 350 word maximum).

*Editorials, Meeting summary, Commentaries, Book review and Opinion pieces* will not require an abstract and will be limited to 2000 words and up to 20 references. A book review is a brief critical and unbiased evaluation of a current book determined to be of interest to the journal audience. Publication of a submitted book review is at the discretion of the editor.

**Artwork**

**General points**

Make sure you use uniform lettering and sizing of your original artwork. Preferred fonts: Arial (or Helvetica), Times New Roman (or Times), Symbol, Courier. Number the illustrations according to their sequence in the text. Use a logical naming convention for your artwork files. Indicate per figure if it is a single, 1.5 or 2-column fitting image. For Word submissions only, you may still provide figures and their captions, and tables within a single file at the revision stage.

**Formats**

Regardless of the application used, when your electronic artwork is finalized, please 'save as' or convert the images to one of the following formats (note the resolution requirements for line drawings, halftones, and line/halftone combinations given below). Please do not supply files that are optimized for screen use (e.g., GIF, BMP, PICT, WPG); the resolution is too low, supply files that are too low in resolution, and, submit graphics that are disproportionately large for the content.

- **EPS (or PDF):** Vector drawings. Embed the font or save the text as 'graphics'.
- **TIFF (or JPG):** Color or grayscale photographs (halftones): always use a minimum of 300 dpi.
- **TIFF (or JPG):** Bitmapped line drawings: use a minimum of 1000 dpi.
- **TIFF (or JPG):** Combinations bitmapped line/halftone (color or grayscale): a minimum of 500 dpi is required.

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Please make sure that artwork files are in an acceptable format (TIFF (or JPEG), EPS (or PDF), or MS Office files) and with the correct resolution. If, together with your accepted article, you submit usable color figures the Journal will ensure that these figures will appear in color on the Web regardless of whether or not these illustrations are reproduced in color in the printed version. Because of technical complications which can arise by converting color figures to ‘gray scale’ please submit in addition usable black and white versions of all the color illustrations.

**Figure captions**

Ensure that each illustration has a caption (Legend). A caption should comprise a brief title below the figure that describes its content and not to be general. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used in the legend. Figure caption should stand for itself (self-explanatory) without the need for consulting the text.

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Number tables consecutively in accordance with their appearance in the text. Place footnotes to tables below the table body and indicate them with superscript lowercase letters within the table. If necessary, such footnotes could be placed at the end of the table title. Avoid vertical rules. Be sparing in the use of tables and ensure that the data presented in tables do not duplicate results described elsewhere in the article (Figures or text). The table caption (Title) should be brief but describes its content and not to be general. Explain all symbols and abbreviations used in the table in the footnote. Table title should stand for itself (self-explanatory) without the need for consulting the text. The table structure should be scientifically organized.
(columns and rows) and its message should be easily comprehensible.

The Editor-in-Chief, on accepting a manuscript, may recommend that additional tables and/or graphs containing important backup data, too extensive to be published in the article, may be published as supplementary material. In that event, an appropriate statement will be added to the text. However, the author should submit such material for consideration with the manuscript.

**References**

References cited should be relevant, up-to-date and adequately cover the field without ignoring any supportive or conflicting publications. Please ensure that every reference cited in the text is also present in the reference list (and vice versa). If present, unpublished results and personal communications may be mentioned in the text and not in the reference list. Citation of a reference as ‘in press’ implies that the item has been accepted for publication, and shows up on PubMed literature search or a copy of the title page of the relevant article must be submitted. DOI of the references - whenever applicable should be presented. Authors are encouraged to cite primary literature rather than review articles in order to give credit to those who have done the original work.

**Reference management software**

This journal has standard templates available in key reference management packages EndNote (http://www.endnote.com/support/enstyles.asp) and Reference Manager (http://refman.com/support/rmstyles.asp). Using plug-ins to word processing packages, authors only need to select the appropriate journal template when preparing their article and the list of references and citations to these will be formatted according to the journal style, which is described below.

**Reference formatting**

There are no strict requirements on reference formatting at submission but should be consistent, complete and up-to-date. Where applicable, author(s) name(s), chapter title/article title, journal title/book title, year of publication, volume, number-issue number/book chapter and the pagination must be present. For the book reference, the edition number, editors (if they are not the authors), publisher and its main address (City and Country) should be added as described below in the example. The reference style used by the journal should be applied to the accepted article at the proof stage. Note that missing data will be highlighted at proof stage for the author to correct. Use peer-reviewed references only except for national and international organizational reporting and registers. If you do wish to format the references yourself they should be arranged according to the following examples:

**Reference style**

Indicate references by number(s) in curved brackets as a bolded superscript at the end of the cited text(s) before the full stop, e.g., ........ shorter hospital stay and lower cost[20]. The actual authors can be referred to, but the reference number(s) must always be given. Number the references in the list in the order in which they appear in the text. The authors list should not be shortened, all authors’ names should be mentioned. For further details you are referred to ‘Uniform Requirements for Manuscripts submitted to Biomedical Journals’ (J Am Med Assoc 1997; 277: 927-34) (see also http://www.nlm.nih.gov/bsd/uniform_requirements.html).

**Examples:**

Reference to a journal publication: Format your journal publications according to the following examples depending on whether; 1) It is already published with specific page numbers, 2 and 3) It is already published with article ID number and pages from 1 to …, or 4) It is published put ahead of print.


**Reference to a chapter in an edited book:** Mettam GR, Adams LB. How to prepare an

Reference to a homepage: It is acceptable to refer to an Organizational Guidelines, Reports, Forms, Data sheets, Questionnaires, etc. It should follow the following format. World Health Organization. Non-communicable Diseases (NCD) Country Profile, 2014 (http://www.who.int/globalcoordinationmechanism/publications/ncds-country-profiles-eng.pdf; last accessed March, 1, 2017).

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Submission checklist
The following list will be useful during the final checking of an article prior to sending it to the journal for review. Please consult this Guide for Authors for further details of any item.

To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

Ensure that the following items are present:
One author has been designated as the corresponding author with contact details for all authors:
- E-mail address.
- Full postal address.
• Telephone.
All necessary files have been uploaded, and contain:
• Keywords.
• All figures and their captions.
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Further considerations:
• Manuscript has been 'spell-checked' and 'grammar-checked'.
• All references mentioned in the Reference list are cited in the text, and vice versa.
• Permission has been obtained for use of copyrighted material from other sources (including the Web).
• Color figures are clearly marked as being intended for color reproduction on and in print, or to be reproduced in color electronically and in black-and-white in print.

PEER REVIEW PROCESS

High quality manuscripts are peer-reviewed by minimum of two peers of the same field along with a biostatistician in the case the study requires. Pre-reviewing advice and help will be provided by the Editor-In-Chief on first submission for initial improvements to meeting the minimum criteria of peer-reviewing. The journal follows strict double blind fold constructive review policy to ensure neutral evaluation. During this review process identity of both the authors and reviewers are kept hidden to ensure unbiased evaluation. A cycle of one-month reviewing process is the target of the journal from submission to final acceptance. For meeting this goal, the Editor-In-Chief is expecting strict compliance from author hastening corrections and replying editorial requests. Continuous post-publication open peer reviewing is highly encouraged through submitting comments to the Editor on any of the published article that will show up with author reply in the subsequent issue to the journal.

The reviewers’ comments are sent to authors once received. With the help of the reviewers’ comments, FINAL decision (accepted or accepted with minor revision or accepted with major revision or rejected) will be sent to the corresponding author. Reviewers are asked if they would like to review a revised version of the manuscript. The editorial office may request a re-review regardless of a reviewer’s response in order to ensure a thorough and fair evaluation.

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Our message to AUMJ potential reviewers says “Although the Manuscript General Evaluation Form is attached, we like to instigate a policy of constructive reviewing and to do our best to make the submitted manuscripts publishable - provided that it is genuine and contain no major frauds of republication, duplicate use of self data or plagiarism of intellectual properties of the others. Please, make your changes and insert your corrections, comments and suggestions directly into the manuscript text but in a different color. Please also make sure that the author(s) presented an inclusive and updated list of genuine references, applied proper statistics and extracted justified conclusions”.

PATIENT CONSENT FORM

Date: .....................
Place: .................

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I give my consent for this material to be published in Aljouf University Medical Journal and associated publications without limit on the duration of publication.

I understand that the material will be published in Aljouf University Medical Journal will be included in any reprints of the published article. I understand that my name will not be
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Signed: ………………
Full name of the relative: ……………
Relation: …………………

Patient’s Name and Contact Address
Corresponding Author’s Name and Contact Address

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*The Manuscript Assigned Number and Title:* ………

Although the following manuscript general evaluation form is sent to reviewers, AUMJ asks the reviewer for further meticulous one-word-at-a-time revision, please. Please insert corrections, changes, suggestions, questions, comments and points of deficiency directly into the manuscript text but in a different color. Also, please do not worry much for the formatting.

*The Manuscript Evaluation Score:* Please, score the manuscript from 0 to 4 (highest) for each of the following items, and sum the total score. Please, also check if the statistics of the results require revision.

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| Appropriate Statistics           |        |   |   |   |   |   |            |
| Relevant Discussion and Justified Conclusions | |   |   |   |   |   |            |
| Tables/ Illustrations/ Figures   |        |   |   |   |   |   |            |
| References: Inclusive and Updated | |   |   |   |   |   |            |
| Total score                      |        |   |   |   |   |   |            |
| Requires Statistical Revision (Mark Please) | Yes | No |            |

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| Yes, with minor revision and alterations: | Accepted with revision |
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*Justification for Decision & Feedback for the Author (REQUIRED):* AUMJ recommends the reviewer to introduce such justifications and feedback into the text at the appropriate places within the manuscript (Specific and Comprehensive Revision).

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**ABSTRACTING and INDEXING**
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   c. Analysis of data.
   d. Drafting the article.
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