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

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AUMJ is dedicated to expanding, increasing the depth, and spreading of updated internationally competent peer reviewed genuine and significant medical knowledge among the journal target audience all over the world.

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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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Inherited Genetic Disorders in Saudi Arabia

Ahmed A. Alfares

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Abstract

Background: Consanguinity and high incidence of population-specific disorders are well-known observations in Saudi Arabia. This review narratively overviews published studies on inherited genetic disorders in the Saudi population.

Methods: All internet-accessible, published articles related to inherited genetic disorders in the Saudi population were reviewed.

Results: Consanguineous marriages and founder mutations specific to tribes or regions in Saudi Arabia result in the commonly encountered genetic disorders in the Saudi population.

Conclusions: Notwithstanding its large population, Saudi Arabia has one of the highest incidences of inherited genetic disorders in the world, primarily because its population has a high rate of consanguinity and tribal founder effects.

Key Words: Genetic disorders, Consanguinity, Tribal founder effects, Saudi Arabia.

Citation: Alfares AA. Inherited Genetic Disorders in Saudi Arabia. AUMJ, September 1, 2017; 4(3): 1 - 7.

Introduction

Saudi Arabia faces an enormously high incidence of genetic disorders. Of many attempts to reduce the burden of inherited disorders for the community, examples include establishing premarital screening for hemoglobinopathies, expanding medical genetics services, sponsoring physicians and scientists in the field of genetics, funding fellowship programs in clinical genetics and master's degree programs in genetic counseling, increasing awareness of inherited disorders through the media and launching the Saudi Human Genome Program (SHGP), which aims to sequence 100,000 human genomes to conduct world-class, genomics-based biomedical research on the Saudi population. In 2018, the Saudi Council of Cooperative Health Insurance (https://www.cchi.gov.sa) issued a unified health insurance policy that mandated coverage of genetic disorders related to birth defects.

Commonly encountered genetic disorders in the Saudi population include organic acidemia, thalassemia, primary microcephaly, Bardet-Biedl syndrome, intellectual disability, retinal dystrophies, lysosomal storage disorders, congenital glaucoma, Meckel-Gruber syndrome and hearing loss. Inborn errors of metabolism (IEM) are among the most common genetic disorders in Saudi Arabia, with an estimated incidence of 1 in 591 for all IEM, including small and large molecules, and 1 in 1043 for all disorders included in newborn screening. Propionic acidemia has the highest incidence, at 1 in 14,000, of all specific IEM disorders in Saudi Arabia. In total, around 60 genetic disorders were first described in Saudi Arabia.

As many clinical geneticists have observed, the type and prevalence of genetic diseases in Saudi Arabia can vary widely compared with the rest of the world. For example, in the Caucasian population, phenylalanine hydroxylase
Consanguineous unions and tribal structure have impacted the incidence of genetic diseases in Saudi Arabia. The maintenance of tribal lineage and intra-tribal marriages over many generations have retained and spread private genetic variants specific to certain geographic locations and tribes. Some discovered variants are believed to be tribal-specific, but improved data derived from whole exome sequencing have shown these variants to be more tribe-enriched than tribe-specific. Demonstrating the high allele frequency of these variants in the population, many of the founder variants of diverse autosomal recessive disorders were discovered in Saudi patients even without the use of advanced technology, like next-generation sequencing. For example, the c.559G>T p.(Gly187X) variant in the SLC19A3 gene, an Arab founder pathogenic variant causing familial chloride diarrhea, was identified in 1998. In another example, the homozygous deletion of 12 bp c.155–166del p.(Ser52_Gly55del) in the TBCE gene, which causes Sanjad–Sakati syndrome and presents with hypoparathyroidism, retardation, delay of growth and development, was identified and reported in 2002 in both Kuwaiti and Saudi patients. The well-known splice junction variant in the Arabic population in the CA2 gene (c.297+1G>A), which causes carbonic anhydrase type II deficiency that leads to osteopetrosis autosomal recessive type 3, was initially reported in 1992. The c.436delC p.(Ala147Hisfs*9) in the DCAF17 gene was reported in 2008 from patients with Woodhouse-Sakati syndrome, which presents with extrapyramidal signs, hypogonadism, diabetes mellitus, alopecia and mental retardation.

Other disorders with founder variants that are particularly common in provinces with high rates of intermarriage and tribal unions include hereditary hemoglobin disorder β-thalassemia and sickle cell anemia. Furthermore, the high incidence of rare genetic and metabolic disorders in certain tribes has made those disorders clinical markers during the diagnostic and clinical evaluation of patients and
individuals from those tribes. The combination of tribal societal structure, large family size and high rates of consanguinity have raised the prevalence of certain autosomal recessive diseases to alarming levels in Saudi Arabia. For instance, some metabolic disorders in Saudi Arabia - such as maple syrup urine disease, very-long-chain fatty acid deficiency and propionic acidemia, are almost entirely limited to specific tribes, which have prevalence five-to-ten times higher than their worldwide incidence(26).

Other non-metabolic founder variants are also common in Saudi Arabia. The well-known ADAT3-related intellectual disability has been described in many individuals from Saudi families with the homozygous founder variant c.382G>A p.(Val128Met). These individuals often have cognitive impairment, microcephaly, epilepsy, nonspecific brain abnormalities and dysmorphic facial features. ADAT3-related intellectual disability is considered a recognizable cause of intellectual disability in Saudi Arabia(27,28). Another commonly encountered disease-causing variant, is the well-known gene C12orf57, that causes Temtamy syndrome, a form of intellectual disability characterized by ocular involvement, epilepsy and dysgenesis of the corpus callosum. Its founder variant occurs in the methionine ATG starting codon of the gene (c.1A>G: p.Met1?) and completely abolishes gene translation(29). This variant alone represented around 1.5% of all positive cases in one of the large cohorts of Saudi individuals, unselected for phenotype, who underwent whole exome sequencing(17).

Among disorders in Saudi Arabia with the autosomal recessive mode of inheritance, roughly one-third are estimated to result from founder mutations, with the remainder being private and limited to the family in which the variant was identified. An estimated 42% of disease-causing variants in the Saudi population are founder mutations(17). As-yet unreported disease-causing founder variants are currently being discovered in many genetics clinics, local and international diagnostic laboratories and research laboratories. Reporting founder variants greatly benefits not only the individual family but also often the whole tribe. For example, the highest calculated carrier frequency for a single disease-causing variant in the Saudi population, 0.015, is for a founder variant in the CYP1B1 gene NM_000104.3 c.182G>A p.(Gly61Glu), which causes congenital glaucoma(30). Knowing this improves management and treatment in addition to genetic counseling and prevention. Beside single-gene disorders, many studies have reported that polygenetic and multifactorial disorders are very common in Saudi Arabia, attributing this, too, to the high rates of consanguinity. For example, there is high incidence of congenital heart disease across the country, an increased rate of gastrointestinal tract anomalies in the Asir region, and significantly higher prevalence of hypothyroidism and hyperthyroidism in the Najran region(31). However, because there is no national registry of complex disorders, because of the influence of lifestyle and phenocopies and because robust epidemiological statistical studies on large cohorts have been limited, the impact of consanguinity on the incidence of complex disorders is controversial. Nevertheless, the discovery of Mendelian forms of complex disorders can provide useful information for understanding the pathophysiology of these diseases. For example, the gene DNASE1L3 is linked to an autosomal recessive form of systemic lupus erythematosus (SLE), which is a multifactorial, complex autoimmune disease(32). Mutation of the gene LRPAP1 has been associated with severe myopia(33). The genes GNB5, LRBA and TBXT have been linked to the Mendelian forms, respectively, of neuropsychiatric disorders, inflammatory bowel disease with combined immunodeficiency and neural tube defects(34,35).

Previous reports have shown that, as expected, most disease-causing variants in the Saudi population are homozygous. Around 81% of all reported monogenic disorders in Saudi Arabia are autosomal recessive. Of these recessive disorders, 97% are homozygous, consistent with the high rate of consanguineous unions in the
Saudi population. Compound heterozygous variants account for 5%. Non-recessive disorders in Saudi Arabia are less prevalent, accounting for 10-27% of autosomal dominant disorders and only 2-5% of X-linked disorders (Figure 1).

Dual diagnosis occurs in 3.3-6% of cases, as established by molecular testing. This is similar to the published rate internationally, which is perhaps somewhat less than expected given the high rate of Saudi consanguinity\(^\text{17,18}\).

Figure 1: Distribution of genetic disorders in Saudi Arabia by mode of inheritance and allele state.

**Results**

**Prenatal Genetics, Prevention Genetics and Ethical Considerations**

Prenatal genetic testing in Saudi Arabia is constrained by ethical and cultural beliefs, in addition to Islamic law. Although many prenatal services are available across the country, the clinical utility and impact of prenatal diagnostic modalities are inadequate, with either limited availability around the country or extended time required to obtain results. However, recent years have seen growth in chorionic villus sampling and amniocentesis, in addition to non-invasive prenatal screening.

Pre-implantation Genetic Diagnostic (PGD) services are not available in Saudi Arabia today, except in a few governmental and private centers. Normally, such services are performed primarily for carriers of chromosomal structural changes, such as translocations, or for monogenic diseases. Both yield good results, but Saudi Arabia faces many social, financial and cultural limitations on services for the prevention and control of genetic disorders. Around 35% of couples choose preimplantation genetic diagnosis (PGD), compared to 45% of couples during the early stages of pregnancy opt for prenatal diagnosis\(^\text{36}\). PGD provides an ideal alternative to terminating a pregnancy, which is constrained by Islamic law. Non-invasive prenatal genetic screening (NIPS or NIPT) is also available in the country; however, there are no clear guidelines available regarding whom or for what to test.

Congenital and genetic disorders are responsible for a major proportion of infant mortality, morbidity and disability in Arab countries\(^\text{37}\). Public health measures, though insufficient, have been directed at the prevention of inherited disorders. The inadequacy of such measures is coupled with inadequate health care and services for prevention and control, as described above. All of this leads to a high incidence of handicapped children in Arab countries. Since most genetic disorders have no treatment yet, one of the main goals of genetics is to prevent severe outcomes. The goals of prevention are to lower the incidence of genetic disorders, prevent a child with chronic illness from burdening families or communities and minimize the economic impact of genetic disorders, which can be highly costly in terms of management and treatment. Genetic disorders can be prevented in many ways.
For example, Saudi Arabia implemented mandatory premarital screening for hemoglobinopathies (thalassemia and sickle cell anemia). However, the decision of how to act based on the outcome of screening is left for the couple to decide. Also, carrier testing for well-known familial variants is available at many governmental and private laboratories. Recently, some laboratories and hospitals have started to offer whole exome sequencing as a means to test individual’s carrier status for any lethal or chronic genetic disorder; this is intended primarily for consanguineous couples. One paper estimating the impact of premarital screening on the incidence of the two hemoglobinopathies demonstrated a reduction in thalassemia but no change in the incidence of sickle cell anemia (1).

Saudi Arabia follows Islamic law. Fatwa number 4 of the Islamic Fiqh Council of the Islamic World League, Makkah Al Mukaramah, at its 12th session (Makkah, 10-17 February 1990) contemplates the option of abortion or termination of pregnancy under certain, specific conditions. Islamic bioethics emphasizes the importance of preventing illness, and Islamic jurists highly recommend any measure to prevent mental handicap in children (38). The fatwa determined that pregnancy may be terminated only if a committee of three competent and specialized physicians has decided the malformation in the fetus is very serious and untreatable or unmanageable and that its quality of life would impact both the family and itself. In such cases, the termination of pregnancy may only be performed prior to the 120th day after conception (before ensoulment: computed from the date of fertilization, not the last menstrual cycle) (38). After 120 days, meanwhile, termination of pregnancy is only allowed in cases where there is a threat to the mother’s life. Based on this fatwa, Saudi hospitals will terminate fetuses with severe congenital disorders. Adoption is not acceptable in Islamic law, though fostering children is allowed; the ancestry of the child must persist with his or her biological parents. Advances in fetal-maternal medicine and in vitro fertilization have led to new applications, like sperm, ovum or pre-embryo donation and other interventions. All of these practices are unacceptable in the view of Islamic teachings, which recognize procreation only within the bounds of husband and wife and exclude any third party from the process. Furthermore, no procreation is allowed after the death of a spouse or in the event of a divorce.

Conclusions

Certain inherited disorders are common in the Saudi population, as is well-known, due to a high rate of consanguinity which has led to founder mutations in specific tribes. While medical genetics services in Saudi Arabia are limited and constrained by ethical and cultural beliefs, in addition to Islamic law, immediate efforts have been made to reduce the burden of inherited disorders on the community. These include establishing premarital screening and launching the Saudi Human Genome Program (SHGP). Nonetheless, clear practical guidelines and expansion of clinical genetics services are required to alleviate the impact of inherited disorders on the population.

Funding

This review was self-funded.

Conflict of Interest

The author declared no conflict of interests.

Disclosure

Some sections in this review article are part of book chapter (39).

References


Original Article

Vision-related quality of life in myopic patients: Surgical versus non-surgical correction

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Abstract

Background: Myopia is one of the most common treatable errors of refraction.

Objective: To compare the improvement in quality of life (QoL) after corrective methods presently in practice including glasses, lenses and surgical correction.

Participants and Methods: It’s a cross-sectional study conducted in Qassim University wherein a sample of 424 students (males and females inclusive) was taken as study population. The evaluation instrument used was a questionnaire (NEI/RQL-42) which was distributed among the study population using simple random sampling. The questionnaire is based on 13 different scales including 214 (50.47%) subjects who were found to have myopia that was corrected by either glasses or lenses. Similarly, 58 (27.10%) study subjects had their myopia corrected by refractive surgery. The remaining 152 subjects (35.84%) were emmetropic who were compared with subjects having corrected errors of refraction in term of vision-related quality of life. The questionnaire included 13 different subgroups (score 0 - 100) related to vision. Data was analyzed using SPSS software 22.

Results: Among all studied subjects, the myopia was the commonest error of refraction found in 214 (50.47%) subjects. Among all 424 participants, the mean (±SD) of QoL scores for emmetropia, refractive surgery and spectacles/lenses were 97.9 ± 6.56, 84.8 ± 7.99 and 79.4 ± 11.98, respectively. The emmetropes had the highest QoL score, whereas the correction of myopia by surgical means was found to be comparable and subjects with correction of myopia by glasses and lenses had the worst QoL scale.

Conclusions: Surgical correction of myopia has a far better score on QoL scale compared to correction by glasses and lenses. However, emmetropes have the best score on QoL scale compared to both techniques of myopia correction.

Key Words: Myopia, Surgical correction, Correction with lens and glasses, Quality of life, Saudi Arabia.


Introduction

The sight is generally taken as the most essential sense for appreciating the size and shape of organs and objects and thus occupies an essential role in managing most human exercises and practices. Any damage or alteration in this sense can greatly affect the quality of life of an individual. The untreated errors of refraction contribute substantial number in overall blindness and visual disturbances regardless of age and gender1). Vision debilitation is a main and to a great extent preventable reason for incapacity all around the world. Refractive errors are the second reason after cataract, causing visual deficiency.
among various age groups, and it can likewise cause visual impedance\textsuperscript{3-5}).

The common errors of refraction include myopia (nearsightedness), hyperopia (farsightedness) and astigmatism. The common complains are blurred vision, headache etc. Studies reported in the past uncovered that those individuals who experience the ill effects of refractive errors frequently don't utilize the best technique for adjustment of vision\textsuperscript{6}). Individuals with uncorrected errors of refraction can actually become handicapped in their personality that can bring a real misery to their life by making it difficult to carry out daily activities\textsuperscript{7-77}. Using spectacles and lenses has enjoyed unique position as the best method of correction since last decade when surgical methods of correction gained a significant popularity as claimed by Garamendi\textsuperscript{18}). People using glasses have the lowest satisfaction followed by lenses, while surgical correction scored the highest as reported by Pesudovs et al\textsuperscript{9}). The present study focused on the quality of life (QoL) after correction of myopia by all the different methods comparing each with emmetropes in the targeted study population.

**Participants and Methods**

This is a cross-sectional study performed in Qassim University from September 2016 to May 2017, wherein a sample of 424 students (154 males and 270 females) was taken anonymously as study population. The demographic details of the study subjects have been summarized in Table 1. The QoL questionnaire (NEI/RQL-42) was used in the study as an evaluation instrument as described previously\textsuperscript{10}). Briefly, the NEI-RQL-42 is a refractive error related QoL survey with a little complexity in its design. Its 13 subscales contain 42 questions, which incorporate 16 diverse question/response class positions. Simple random sampling technique was applied for the distribution of questionnaire. This study was ethically approved by the College of Medicine Ethical Committee (ECCom#2/2016) and informed written consents were taken from all participants involved. Once the objective of the study were explained, all participants volunteered to go through and fill the questionnaire and. The participant’s privacy was well maintained and their names were kept confidential through coding. Out of all studied subjects, 210 subjects were found to be emmetropic which were used a control subjects, whereas 214 subjects were found to have myopia. Out of 214 myopic subjects, 58 were corrected by refractive surgery and 156 were corrected by spectacles and lenses.

Study population: Students from different colleges and different age groups were reviewed in the ophthalmology clinics in the University Clinics, wherein a thorough examination was performed. Briefly, each participant was examined by auto-refractometer (Auto Refractometer ARK-510A, NIDEK, Aichi, Japan). Three measurements were taken of each participant’s refractive status for each of their both eyes. Refractive error measurements were recorded in sphere, negative cylinder, and cylinder axis format. The readings were recorded on a data sheet for every individual and the statistical analysis was performed using Statistical Package for Social Sciences (SPSS). In addition, a detailed history was taken about co-morbidities and history of previous surgery for the correction of the errors if any. All calculations of refractive error status were based on the non-cycloplegic auto-refractometer readings. Spherical equivalent (SE) was calculated as sphere plus half cylinder. Myopia was defined as SE of at least -0.75 diopters (D) in either eye. Myopes were divided into three refractive error sub-groups based on their refractions (SE): low myopia (SE between -0.75 and -2.99 D), moderate myopia (SE between -3.00 and -5.99 D), and high myopia (SE equal to or more myopia than -6.00 D). Hyperopia was defined as SE + 1.00 D or more positive and emmetropia as spherical equivalent value between SE -0.75 D and SE + 1.00 D in either eye. Astigmatism was defined as ±1 Cylinder or more. All participants were asked to fill the NEI-RQL-42 questionnaire after explaining objectives of the study.

Inclusion and exclusion criteria: All patients with hypermetropia were excluded while all myopic with corrected vision by any means of refractive surgery
or spectacles and lenses were included in the study. All students with myopic astigmatism were also included. The time limit set for the students to be taken in the study after surgery was minimum 6 months.

Data analysis: The data was analyzed statistically using SPSS version 22.0. The Fisher’s exact and Pearson’s Tests of chi-square were applied among the categorical variables. The level of P value <0.05 was statistically considered as significant.

Results
This cross-sectional study comprised 424 study subjects with mean ± SD (range) age of 22.1 ± 11.5 (18 - 28) years. The study population comprised of 154 (36.32%) males and the remaining 270 (63.67%) were females (Table 1). Out of all studied 424 subjects, the myopia was the commonest error of refraction presented in 214 (50.47%) subjects. Table 1: Demographic details of studied participants for the assessment of vision-related quality of life (n = 424). Data shown are frequencies [n (\%)] and mean ± SD (range).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean ± SDM (Range) or n (%)</th>
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</thead>
<tbody>
<tr>
<td>Age (Years):</td>
<td>22.1 ± 11.5 (18 – 28)</td>
</tr>
<tr>
<td>Age distribution groups:</td>
<td></td>
</tr>
<tr>
<td>&lt;19</td>
<td>08 (1.88)</td>
</tr>
<tr>
<td>19-24</td>
<td>361 (85.15)</td>
</tr>
<tr>
<td>&gt;24</td>
<td>55 (12.97)</td>
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<tr>
<td>Gender distribution:</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>154 (36.32%)</td>
</tr>
<tr>
<td>Females</td>
<td>270 (63.67%)</td>
</tr>
</tbody>
</table>

The myopia was corrected by either power glasses/lenses or by refractive surgery. The correction of myopia was done by refractive surgery in 58 (27\%), among them the LASIK surgery was done in 37 (17.3\%) and Photorefractive keratectomy (PRK) was in 21 (9.8\%). Whereas, the remaining 156 (73\%) were corrected by glasses and lenses - among them 108 (50\%) were corrected by glasses and 48 (22.4\%) were by lenses. Of the total number of myopics, 60 (27.77\%) were males and 156 (72.22\%) were females. The number of surgical correction of myopia was highest among females (30\%) while 70\% wore glasses and lenses. On the contrary, only 6\% of males had surgical correction of myopia and 94\% wore glasses and lenses. The emmetropes were found to have the highest score on the quality of life score (97.89). Correction of myopia by surgical means was found to have comparable score on QoL score (84.78). Subjects with correction of myopia by glasses and lenses vision had the minimum QoL score (79.43). There was a statistically significant difference when the studied groups were compared to the Emmetropia participants (p <0.01). The detailed description of these results is summarized in Table 2.

Table 2: Comparison of the different groups of participants assessed for vision-related quality of life. Data shown are n, mean ± SD and p value.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean ± SDM</th>
<th>p Value (vs. Emmetropia)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emmetropia</td>
<td>210</td>
<td>97.89 ± 6.56</td>
<td>-</td>
</tr>
<tr>
<td>Refractive Surgery</td>
<td>58</td>
<td>84.78 ± 7.99</td>
<td>P&lt;0.001</td>
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<tr>
<td>LASIK</td>
<td>37</td>
<td>87.06 ± 6.10</td>
<td>P&lt;0.01</td>
</tr>
<tr>
<td>PRK</td>
<td>21</td>
<td>82.50 ± 9.48</td>
<td>P&lt;0.001</td>
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<tr>
<td>Spectacles</td>
<td>108</td>
<td>80.75 ± 13.75</td>
<td>P&lt;0.001</td>
</tr>
<tr>
<td>Lenses</td>
<td>48</td>
<td>78.11 ± 10.21</td>
<td>P&lt;0.001</td>
</tr>
</tbody>
</table>

Discussion
Errors of refraction are common and treatable reasons of blindness all over the world. Internationally, myopia is the commonest error of refraction, affecting individuals regardless of sex and age. We attempted to make a correlation between the vision-related personal satisfaction of nearsighted subjects who wear glasses or lenses and that of the individuals who have experienced refractive surgery and furthermore to look at the quality of life of these two sets with that of emmetropes. Albeit all patients in each group were thought to be effectively corrected, personal satisfaction identified with vision was distinctly different in different subsets of individuals.

The present study discovered a substantially better self-satisfaction and a comparably higher score on QoL questionnaire by individuals whose myopia is corrected by surgical means (p
Impairment in a rural south Indian community. We conducted a study on vision loss based on vision correction by glasses and lenses versus surgical correction of myopia. It is evident that the personal satisfaction for individuals with correction was done by lenses and glasses was not as much as in subjects with myopia who had the refractive surgery. However, personal satisfaction among individuals with myopia who had the refractive surgery was superior to individuals with emmetropia. It is very evident that surgery either by LASIK or PRK were about one third of the total cases corrected by glasses or with the lenses, this may be one of the factor that might had effect the comparison.

Despite of this, there are various other studies which are in line with these results. Our results indicated that refractive surgery is opted by more females than males. This finding is also in line with other similar reports indicating surgical correction in a larger proportion of females. A better cosmetic result may be the reason behind this direction of more women opting for surgical correction of myopia. The surgical correction gives an overall high satisfaction and self-confidence about performing daily tasks and feeling of an improved vision. The group, where correction was done by lenses and glasses has lack of satisfaction based on vision related quality of life as well as cosmetic effect. Thus, the important observation of the study is that the myopic subjects with glasses or lenses were not happy with their vision-related QoL as compared to those who had surgical corrections.

Conclusions
Personal satisfaction for individuals with nearsightedness who had the refractive surgery was superior to individuals with corrected myopia with lenses and glasses (p <0.001). However, personal satisfaction among individuals with myopia who had the refractive surgery was not as much as in subjects with emmetropia. It is very evident that surgical correction of myopia outweighs correction by glasses and lenses. Limitations of the Study

- The study outcomes are limited to Qassim University students.
- Unequal distribution of age of subjects among the studied groups.
- Unequal gender distribution of the studied subjects.

Funding
This study was funded by College of Medicine, Qassim University, Saudi Arabia.

Conflict of Interest
The authors declared no conflict of interests.

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Prehypertension and Hypertension among Patients with Type 2 Diabetes Mellitus from Bisha, Saudi Arabia

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Abstract

Background: Diabetes mellitus (DM) and hypertension are among the most common non-communicable chronic diseases in developed and developing countries around the world. Early detection of prehypertension and hypertension in diabetic patients has major effect in reducing and delaying the complications.

Objective: This cross-sectional questionnaire-based study was designed to assess the prevalence of pre-hypertension, hypertension and the associated risk factors among patients with type 2 DM (T2DM) in Bisha City, Saudi Arabia.

Methods: The study enrolled 605 patients with T2DM who were attending primary health care centers for follow-up during the period of September 2016 to April 2017 in Bisha city, southwest of Saudi Arabia. Blood pressure and anthropometric measurements were measured using the standard methods. Data entry and analysis was carried out using Statistical Program for the Social Sciences (SPSS). P value of <0.05 was considered as statistically significant.

Results: The overall prevalence of prehypertension and hypertension was found to be 48.3% and 34.5%, respectively in this study. Both prehypertension and hypertension were significantly associated with age (p = 0.012) but only the hypertension was significantly associated with obesity (p = 0.003).

Conclusions: Prehypertension and hypertension is common co-morbidities among T2DM patients were they reaching alarming rates in the study patients. Strategies are needed to enhance the effectiveness of disease management, patient adherence and necessary lifestyle modifications to control blood pressure and preventing its complications.

Keywords: Prehypertension, Hypertension, Type 2 Diabetes mellitus, Risk factors, Saudi Arabia.

Citation: Al-Shahrani AM. Prehypertension and Hypertension among Patients with Type 2 Diabetes Mellitus from Bisha, Saudi Arabia. AUMJ, September 1, 2017; 4(3): 15 - 20.

Introduction

Hypertension (HTN) has been known as the risk factor of cardiovascular disease (CVD). Moreover, blood pressure (BP), even within the normal range, is associated with cardiovascular system (CVS) morbidity and mortality. Therefore, in 2003, a new category termed pre-hypertension was defined for patients with systolic BP of 120 - 139 mmHg or diastolic BP of 80 - 89 mmHg by the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. Pre-hypertension is a known precursor for hypertension. If prehypertension is controlled, it will prevent or delay hypertension. Recent studies have shown that hypertension is associated with the risk of diabetes mellitus (DM) and CVDs. Prevention of hypertension reduces the risk of DM, stroke and CVDs.
To improve the strategies of controlling prehypertension, it is necessary to diagnose it and to identify the associating risk factors. Some studies have shown that hypertension and pre-hypertension are associated with age and sex\(^5\). In Saudi Arabia, there are few studies assessing the prevalence of prehypertension and its predictive risk factors\(^8\). These reports studied people from other Saudi provinces, but not Bisha province. Since there is significant differences in the prevalence of DM among the Saudi areas, the prevalence of pre-hypertension and hypertension among these patients is expect to differ, too.

Hypertension is a major modifiable risk factor for CVS morbidity and mortality. Diabetes is associated with a high risk of CVD and is the leading cause of end-stage renal disease, blindness, and nontraumatic amputations in western countries\(^11\). Although the effects of DM and hypertension on the CVS vary somewhat, and are often distinct, their combined presence in the same patient is destructive\(^12\). Coronary artery disease is far more common in diabetic hypertensive patients than in patients suffering from hypertension or diabetes alone\(^13\).

This study aimed to determine the prevalence of prehypertension and hypertension along with their associated risk factors among T2DM patients attending primary health care centers (PHCCs) in Bisha, southwest of Saudi Arabia.

**Patients and Methods**

**Participants:** This was a cross-sectional study conducted during the period of September 2016 to April 2017 among T2DM patients at the age of ≥18 years, who were registered in the diabetic registries of Bisha City Health Sector comprising 15 PHCCs. Among these, there are three Saudi Reference Centers. The latter receive referred patients from the other thirteen PHCCs. Each diabetic patient receives DM and HTN care by trained family physicians and nurses. There was a total of 641 T2DM patients registered in the three reference centers. 605 of them were finally included in this study; who were attending the centers during the study period and were voluntarily willing and written consented to participate. This gave a participation rate of 94.4%. There were no other exclusion criteria. Their data were anonymously recorded. All procedures performed in the study were in accordance with the ethical standards of the Research Committee, College of Medicine, University of Bisha, where the study was ethically approved. The confidentiality of the data had been assured through Data coding.

**Data collection and measurements:** Data were collected by trained physicians and nurses, using a structured questionnaire that included socio-demographic, anthropometric indices and related lifestyle data (age, gender, BMI and smoking status), information regarding hypertension. Weight was measured in kg and height was measured to the nearest 0.5 cm. Body mass index (BMI) was calculated as kg/m\(^2\) for all participants and was categorized as normal at <25 kg/m\(^2\), overweight at 25-29.9 kg/m\(^2\) and obese at ≥30 kg/m\(^2\)\(^{14}\). BP was measured by trained nurse using standardized sphygmomanometers with appropriately sized cuff for age and weight while the subject was in a sitting position with the arm at the level of the heart and after 5 minutes rest. An average of twice readings of blood pressure taken ten minutes apart was used in the study. The prehypertension was defined as systolic blood pressure between 120 - 139 mmHg and/or diastolic blood pressure between 80 - 89 mmHg, and hypertension was defined as systolic BP ≥140 and/or diastolic BP ≥90 mmHg or current use of antihypertensive medication\(^4\).

**Statistical methods:** Data analysis was done using the Statistical Package for Social Sciences (SPSS) version 23. Frequency distributions and Chi-Square statistics were used for categorical variables and mean ± standard deviation (SD) were obtained on continuous variables where Student’s t-test was used. Analyses were performed to assess the effect of age, gender, BMI, and smoking on prehypertension and hypertension. A p ≤0.05 was considered statistically significant.
Results

The study sample consisted of 605 T2DM patients. Males and females constituted 383 and 222 of the sample, respectively. They had mean age of 55.7 ± 13.9 years. The prevalence of prehypertension and hypertension among the studied diabetic patients was 48.3% and 34.5%, respectively, as shown in Figure 1.

![Figure 1: Frequency distribution of normo-tension, pre-hypertension and hypertension among study type 2 diabetic Saudi patients (n = 605).](image)

Table 1 showed that the prevalence of prehypertension and hypertension are increased proportionally with increasing age past 40-years (90.8% and 92.8%, respectively) that revealed significant positive association (p = 0.048 and 0.012, respectively). The prevalence of obesity among the study prehypertensive population was 51%, whereas, among overweight patients it was 34.6% only. Hypertension was found to positively associate with overweight and obesity (p = 0.003) while the prehypertension was not found to associated with overweight and obesity (p = 0.171). In this study, 14.1% of patients had a history of cigarette smoking and 7.9% and 6.2% of pre-hypertensive and hypertensive patients were current smokers, respectively. In the multivariate analysis, there was a positive and statistically significant association between each of pre-hypertension and hypertension vs. each of age and BMI, but they had no significant association with each of gender and smoking in the study population.

Discussion

T2DM and hypertension are considered as most common chronic non-communicable diseases and multifactorial disorders found in both developed and developing countries and occur at a higher prevalence in the older age group and result from both genetic and environmental etiological factors. Several studies showed that “prehypertension” is common and is associated with the metabolic syndrome and other CV risk factors, such as obesity, elevated triglycerides, elevated LDL cholesterol, and low levels of HDL cholesterol. Furthermore, during follow-up, subjects with prehypertension are more susceptible to developing true hypertension and coronary atherosclerosis. Prehypertension includes two different categories of BP that are used by the European Society of Hypertension: normal BP (systolic 120-129 mmHg, or diastolic 80-84 mmHg) and high-normal BP (systolic 130-139 mmHg or diastolic 85-89 mmHg). Grotto et al. showed that subjects with high prehypertension, which is equivalent to high-normal BP,
have elevated levels of glucose, total cholesterol, triglycerides, and BMI and lower levels of HDL cholesterol than those with low prehypertension equivalent to normal BP.

In the current study, prehypertension was detected among 48.3% of population; 61% of men and 39% of women which are similar to results reported by Grotto et al.(19). These results also agree with results from China(22) Attica(23) and Iran(24). A lower rate (34%), however, was reported among Taiwanese adults(25). On the other hand, 54.1% of prediabetic Omani population, 2008, had pre-hypertension. This higher rate may be because the Omani study was conducted among prediabetic individuals(26).

Results of the multivariable analysis regarding prehypertension and hypertension, in the current study, illustrated that age, male gender and BMI were the main predictors. Similarly, Taiwanese adult men revealed that age and BMI were the determinants of prehypertension status(25). Results from China(22,27) and India(6) also revealed that overweight and obesity were predictors for pre-hypertension. The study of Oman found that individuals with higher BMI have a twofold estimated risk of developing prehypertension and the increased level of Oral Glucose Tolerance (OGT) enhanced the risk of developing pre-hypertension(26).

While this article was in the galley revision stage, and because of the pathogenetic implication of prehypertension, the new ACC/AHA High Blood Pressure Guidelines was issued 2017. The blood pressure categories in the new guideline are; 1) Normal BP = SBP/DBP <120/80 mmHg, 2) Elevated BP = SBP/DBP 120-129/<80 mmHg, 3) Stage 1 hypertension = SBP 130-139 or DBP 80-89 mmHg, and, 4) Stage 2 hypertension = SBP ≥140 or DBP ≥90 mmHg(28).

Conclusions

Prehypertension and hypertension are highly prevailing among the studied patients with type 2 diabetes that submit them to a high risk for both microvascular and macrovascular complications. Efforts to establish preventive and curative strategies in the primary health care services would be of great benefit in controlling high blood pressure and preventing its complications.

Limitations of the Study

- Literatures treating the same subject are scanty that limited our comparisons.
- The fortunate low prevalence of smoking among our population masked an expected relationship with both of pre-hypertension and hypertension.

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Conflict of Interest

The author declared no conflict of interests.

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Nurses’ Knowledge, Attitudes and Beliefs toward Pressure Ulcers Prevention

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Abstract

Background: Pressure Ulcers (PUs) is a worldwide health concern that contributes to mortality among bedridden patients. When present, PUs can cause chronic, infected and hard to treat wounds. Patients with PU have a greater mortality risk and complications such as pain, delayed healing, septicemia and longer hospital stay. Prevention of PU in hospitalized patients is the responsibility of nurses.

Objective: To assess nurses’ knowledge, attitudes and beliefs towards PU prevention.

Participants and Methods: A cross-sectional descriptive study using the Attitude towards PU Prevention instrument (APuP). Data were collected from five public hospitals in Saudi Arabia (SA) including a rehabilitation hospital. Nurses who agree to participate in the study were asked to complete and return a survey questionnaire. 170 questionnaires were completed and returned.

Results: Senior nurses were shown to have better PU knowledge and attitudes than younger nurses (p <0.001). The t-test showed that mean scores of Saudi nurses were systematically lower than non-Saudis by about 5 points (p = 0.004). Surgical, orthopedic and rehabilitation nurses scored higher compared to nurses working in critical care and medical departments. The mean PU attitude scores: ‘ICU’ (27.53), ‘medical ward’ (27.62), orthopedic ward (30.92), ‘surgical ward’ (33.63) and ‘rehabilitation center’ (36.38).

Conclusion: Nurses working in different hospital departments had some important score variations with superiority of surgical nurses. Work experience, nationality and age were also important variables in determining the knowledge and attitude of nurses towards PU prevention.

Key words: Pressure Ulcer, Nurses, Attitude, Knowledge, Beliefs, Pressure Ulcer Prevention.

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Introduction

Pressure Ulcers (PUs) as worldwide health problem contribute to morbidity and mortality rate among all age group, especially patients at high risk such as elderly, physically impaired, bedridden and those with neurological deficits. Recent studies confirm that patients with PUs have mortality risk up to six folds greater than patient without PUs. Also, between 6 - 8.6% of all injured patients die as a result of its complication such as septicemia, pain, and delayed healing.

Patients requiring long-term hospitalization and in rehabilitation facilities have a high potential for the development of PU. Universally, maintaining skin integrity and preventing...
Bed sores have traditionally been a nursing responsibility(4). The presence of PUs in hospitalized patients has been identified as a measure of quality in healthcare(5,6). However, if unrecognized and left untreated, PUs can deteriorate into deep, hard-to-treat, chronic wounds that undermine the patient’s health and quality of life(4). Even when healed, ulcers will attain only 80 present of the skin’s original strength making the area vulnerable to re-injury(7). Extensive or slow-to-heal PUs are also prone to infection as they develop(8). In addition to the physical complications of PUs, there are substantial economic burdens as well(9,10). Similarly, occurrence of PUs in hospitalized patients has been linked with the length of stay, which indicates higher costs for management(11).

The cost of treating an established PU can be enormous. There are not only emotional and physical consequences to the individual, but also a significant drain on health system resources(12). The world Stop PU Day in 2014 reported that nearly 700,000 patients were affected by PU each year(12). Consequently, more than billion dollars were spent by governments to manage PUs and their complications(13). Due to suboptimal PU prevention strategies, that financial expenditure is drained into treatment rather than prevention(14). Although cost-effectively preventable, PUs remains significant problem in both acute and community healthcare settings. To date, the burden of prevention relies on the nursing professionals(15). In spite of this fact, various studies have shown that nursing professionals have "moderate" knowledge about the prevention of PUs, with less than 38% of facilities have trained professionals in skin and wound care(8). The Australian Bureau of Statistics, for the period of two years, recorded that 923 people died with PUs identified as either the primary or secondary cause of death(16).

Globally, the Prevalence of PUs among high risk patients in Europe, US, Canada and Australia ranges from 8.3 - 25.1%(3). A number of studies highlight the role of nurses to prevent PUs as compared to other healthcare professionals(17,18). A Swedish study surveyed 146 critical care nurses to investigate their attitudes, knowledge and perceived barriers and opportunities towards pressure ulcer prevention(12). The results indicate a mean score attitude of 34 (range 11-5). However, less than half (46.8%) of nurses were able to correctly categorize pressure ulcers. Additionally, nurses reported that pressure relief techniques and nutritional support were the two most effective preventative measures of PUs in the critical care settings. The performance barriers included time (57.8%) and the severity of patients’ conditions (28.9%). In Belgium, a large cross-sectional study across 14 hospitals was carried out to investigate the nurses’ knowledge and attitudes of PUs prevention and nurses’ performance(5). The researchers adapted the Attitude towards PU Prevention instrument (APuP), which they have validated in an earlier study(19). The results shows that nurses’ knowledge of PU prevention was inadequate with a mean score of 49.6%, where, PU education correlated positively with knowledge (p = 0.002). The nurses’ mean score attitude was 71.3% and was positively correlated with longer nursing experience in skin and wound care (p = 0.01). A Turkish quantitative study surveyed 426 nurses in a university hospital to identify nurses’ attitude towards PU prevention(20). The nurses’ attitude was reported to be positive with average score of 43.74 (84.12%). On the contrary, an earlier Jordanian study results were not as promising(21). Nurses’ knowledge of PU prevention was suboptimal, with even some risky PU prevention practices reported in some Jordanian hospitals.

There has been relatively little literature published in SA on PU incidence and the related role of healthcare providers. One study reported an incidence rate of PU in acute care setting of 39.3%, which is quite high and alarming compared to incidence rate in other countries(22). A recent investigation(6) was conducted at the rehabilitation hospital at King Fahad Medical City, which examined the knowledge and attitude of 105 healthcare professionals, including nurses (61.9%)
toward PUs prevention. The study concluded that age and profession are the most significant factors that were associated with statistically significant PU knowledge score (P < 0.001). Notably, most of participants scored an average level of knowledge and showed unsatisfactory attitudes towards PUs prevention with some participants (10.7 %) even considered PUs prevention guidelines ineffective and a waste of time.

The current study aimed to investigate nurses' knowledge and attitudes towards PUs prevention in a group of Saudi public hospitals. A secondary aim was to further assess the validity of the APuP instrument(19) in a different nursing population.

**Participants and Methods**

A non-experimental descriptive study design was used, drawing a convenient sample from five public hospitals, including a rehabilitation hospital, in the north region of Saudi Arabia. These hospitals are Prince Mutaeb general hospital, Gurayat general hospital, Tabarjal general hospital, Domat Aljandal general hospital and Arar rehabilitation center. Only major hospitals were chosen with inpatients including surgical, medical, and orthopedic and intensive care. The study adapts a survey approach to collect data using the APuP survey tool with permission from the author(19).

The target population is the registered nurses, who have at least one year of work experience within the inpatient units. Therefore, a total of 320 registered nurses were invited to participate through personal visits in their units during the morning and afternoon shifts following the hand-over of patients. In addition, email invitations and a note was posted in the unit with an electronic link to the survey were used to encourage participation(23). For the purpose of the research, a staff nurse was defined as any practicing nurse who registered to practice under the general division of the Saudi health as a specialist or technician.

The current study was approved by the Local Committee of Bioethics (LCBE) in Jouf University (5/4/37/38). Participation was voluntary, all survey questionnaires contain a front explanatory page about the study aim and purpose and the contact number of the primary investigator. Nurses who complete and return surveys were assumed to have accepted participation in the study(23).

The APuP scores were calculated based on the answers of nurses to the 13 items in the APuP survey. The scores were first used to calculate the scores of 5 APuP factors, which were in turn used to obtain the overall APuP scores. The scores for negatively worded items were reversed during the analysis. This way, more positive PU attitude corresponded to higher scores in all the answers. The results of the questionnaire were then analyzed in order to find correlations with the demographic variables of the respondents, such as gender, age, nationality and work place. Significance of the score differences between demographic groups was assessed with an independent samples t-test. The demographic variables which were theoretically expected to produce higher PU scores (Work experience and Education) were then used to assess the validity of the APuP instrument (Known Groups Analysis)(24). The significance of the results was assessed by independent samples t-test. The validity of the APuP tool was further assessed by re-running factor analysis on responses to the original 13 questions and assessing whether a 5-factor solution was optimal for the survey. The internal consistency of the 5-factor solution for the sample was assessed by calculating Cronbach’s α(23).

Statistical analysis was performed with IBM SPSS 23.0 software.

**Results**

The total number of completed surveys was 170 (53% response rate); of them 98% were between 20 and 40 years and included about 30% male and 70% female. More than half of the nurses (55%) were Saudis, with the majority (95%) working in general hospitals' inpatient departments (between 20 and 30%) orthopedic ward, medical ward, surgical ward and ICU, whereas, nearly 5% represent the rehabilitation center. The vast majority of nurses (96.5%) had either a Diploma (25.3%) or bachelor's
degree (71.2%), with work experience between 1 and 10 years (91.8%).

The histogram of the overall PU scores (Figure 1) showed a bi-modality, with about 40% of the nurses had a PU attitude score above 30 points while 60% had scores below 30 points. A similar bimodality was observed in the scores of PU factors 1, 2 and 3 of the questionnaire ‘Personal competency to prevent pressure ulcers’, ‘Priority of pressure ulcer prevention’, ‘Impact of pressure ulcers’, correspondingly. Instead, the opinions were spread evenly among the participants for PU factors 4 and 5 ‘Responsibility in pressure ulcer prevention’, and, ‘Confidence in effectiveness of prevention’.

Figure 1: The Attitude towards PU Prevention instrument (APuP) scores showing the responses of 170 nurses. The scores were calculated based on five-factor solution of APuP instrument (Beeckman et al, 2010). The observed distribution shows a clear bimodality.

No significant difference in the mean scores between male and female nurses based on the independent groups t-test (t = 0.205, df = 168, p = 0.838). The dependence of PU attitude scores on age, however, was significant (Figure 2), and, in fact the strongest among all the demographic variables. All the nurses, who are older than 30 years, had a PU attitude score higher than 30 points, which partially explains the earlier mentioned bimodality. This correlation is in part related to systematically more work experience of senior nurses.

The t-test showed that age group 2 (26-30 years) had scores on average higher by about 5 points than age group 1, 20-25 years (t = 3.941, df = 124, p <0.001). The difference in scores between age group 2 and age group 3 (26-30 years) had an even higher significance and was about 13 points (t = 13.8, df = 114, p <0.001). The difference between scores of age groups 3 and 4 (36-40 years) was about 4 points (t = 3.875, df = 39, p <0.001) and the difference between age groups 4 and 5 (>40 years) was about 3 points (t = 2.580, df = 12, p = 0.024). Overall, senior nurses were associated with higher PU attitude score.

Figure 2: The Attitude towards PU Prevention instrument (APuP) scores of nurses in correlation with age with older nurses having systematically higher APuP scores that in-part related to work experience.

The t-test showed that mean scores of Saudi nurses were systematically lower than non-Saudis by about 5 points (t = 2.913, df = 168, p = 0.004). Additionally, the departments were ranked in the following order based on their mean PU attitude scores: ‘ICU’ (27.53), ‘medical ward’ (27.62), orthopedic ward (30.92), ‘surgical ward’ (33.63) and ‘rehabilitation center’ (36.38). Based on t-test ‘ICU’ and ‘medical ward’ were consistent with following the same distribution (t = 0.046, df = 94, p = 0.964). Rehabilitation center’ had scores consistent with ‘surgical ward’ (t = 0.587, df = 36, p = 0.561). Concurrently, scores of ICU and medical ward were inconsistent with those of surgical ward and rehabilitation center (P value <0.01). Orthopedic ward had scores compatible with both groups with significance of about 0.2.
Experience and education are theoretically expected to be related to higher PU attitude scores. Therefore, these two variables were used to verify the validity of APuP tool (Known groups' analysis)\(^{(24)}\) for the demographic profile of participants as presented in Table 1. The correlation of PU attitude scores and work experience was found to be weaker than that of PU attitude score and age. Even among the nurses with the least work experience (<5 years) about 10 nurses scored above 30 points. At the same time among the nurses with more work experience (5-10 years) some scored below 30 and as low as 10 points, which is close to the least possible score. The difference between (<5 years) group and (5-10 years) group was found to be significant, about 5.2 points \((t = 5.213, \text{df} = 154, \ p < 0.001)\). Similarly, the difference between 5-10 years group and 11-15 years group was also significant, about 10 points \((t = 3.138, \text{df} = 84, \ p = 0.002)\). The difference between (11-15 year) group and (>15 years) group was less significant due to a small sample size \((t = 1.412, \text{df} = 12, \ p = 0.183)\). Overall, the observed correlation supports the APuP tool.

Due to almost similar academic degrees of the participating nurses the correlation between the PU scores and education was relatively weak (Table 1). Nurses with a diploma degree had a mean score of 29.88, compatible with the mean score of the ones with bachelor's degree of 29.72 \((t = 0.085, \text{df} = 162, \ p = 0.932)\). The holders of master's degree had a smaller mean score of 25.4, but due to a small sample size the difference was insignificant \((t = 0.942, \text{df} = 46, \ p = 0.351)\). The spread in academic degrees between nurses was not large enough to conclusively support the APuP tool.

Table 1: Known Groups Analysis, nurses work experience and education level scores used to assess the validity of the Attitude towards PU Prevention instrument (APuP). Data shown are n, mean ± SD, and t, df and p values.

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean Score (max = 52) (SD)</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A (Higher score Expected)</td>
<td>Group B (Lower score expected)</td>
<td>t</td>
</tr>
<tr>
<td>Work experience:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5-10 years (A) vs. 0-5 years (B)</td>
<td>75/81</td>
<td>32.6 (10.8)</td>
<td>24.6 (8.2)</td>
</tr>
<tr>
<td>11-15 years (A) vs. 5-10 years (B)</td>
<td>11/75</td>
<td>43.2 (8.0)</td>
<td>32.6 (10.8)</td>
</tr>
<tr>
<td>&gt;15 years (A) vs. 11-15 years (B)</td>
<td>3/11</td>
<td>50.0 (2.6)</td>
<td>43.2 (8.0)</td>
</tr>
<tr>
<td>Education:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachelor's degree (A) vs. Diploma degree (B)</td>
<td>121/43</td>
<td>29.7 (11.3)</td>
<td>29.9 (9.6)</td>
</tr>
<tr>
<td>Master's degree (A) vs. bachelor's degree (B)</td>
<td>5/121</td>
<td>25.4 (13.8)</td>
<td>29.7 (11.3)</td>
</tr>
<tr>
<td>PhD degree (A) vs. bachelor's degree (B)</td>
<td>1/121</td>
<td>52.0 (0)</td>
<td>29.7 (11.3)</td>
</tr>
</tbody>
</table>

Additionally, the factor analysis and consistency test show validity of the factors. It was based on principal-axis factoring method, using Varimax rotation, and subsequently applying KMO and Bartlett’s test of sphericity. The obtained KMO measure of sampling adequacy was 0.945, close to unity, indicating a valid factorization. The Bartlett’s test of sphericity had \(\chi^2\) of 1338.4 at 78 df, giving \(p < 0.001\), as expected when variables are not independent. When rotated, each of the first four factors could explain >10% of the variance, and the fifth factor – only 1.4%, altogether explaining 64.6% of the variance. Repeating the analysis and constraining the solution to only 4 factors was also seen to appropriately describe the data, explaining 62.8% of the variance. The reliability/internal consistency of the data was tested by calculating Cronbach’s
α for the questions of the original questionnaire, which was found to be 0.937, corresponding to an excellent consistency of the dataset. Cronbach’s α for the five factors of the APuP tool was found to be 0.922, also indicating an excellent consistency of the factor five solutions. Overall, the APuP was found to be a valid tool in the current study.

**Discussion**

There is a clear trend that older nurses have better PU knowledge and attitudes than younger ones (p value <0.001). Analyzing the scores of all nurses highlights two distinct groups: those with positive attitude towards PU (40%), who scored above 30, and those with negative attitude (60%), who scored below 30. Notably older nurses (above 30 years) showed consistent positive attitude toward PU and scored more than 30. Indeed, with age comes more work experience and that could enhance nursing skills in caring for patients and preventing injuries and PUs.

In the current study, nurses working in specific units and departments in public hospitals were shown to perform better PU prevention skills. For instance, orthopedic and surgical departments (scored above 30). However, ICU and medical department scored lower than 30, which indicates inadequate knowledge of PUs and poses risks for patients in these units. Similarly, non-Saudi nurses scored systematically more positive PU attitudes than did Saudis. This difference in score between Saudi and non-Saudi nurses could be explained by different educational background, and more work experience for non-Saudi nurses.

Previous studies on this area did not directly compare nurses’ nationalities and staff nurses performance on each unit/department. However, numerous papers reported suboptimal knowledge of nurses and negative attitude towards PU prevention in general(6,8).

Some believe that in public hospitals, nurses’ and other medical professionals are less adherent to evidence-based protocols towards PU prevention, but rather rely on work culture and traditional management strategies(9). This could contribute to declining quality of healthcare provided by public hospitals, because the development of PUs while patients are hospitalized is an important quality indicator of hospital performance. Adapting an evidence-based guidelines and protocols to prevent and manage PUs will substantially improve nursing care and healthcare services provided within these hospitals as whole. It also shortens hospital stays and cost of care(10).

Furthermore, there are a number of factors that could be linked to the results of the current study, and may provide some justifications of the substandard nurses’ knowledge and attitudes towards PUs in some hospital units in SA. The shortage of staff nurses is very common in critical care units in public hospitals. This has been coupled with long working hours with very limited break times during the shift and the lack of teamwork(25). In addition, units lack the services of clerks and other assistive personnel, who can lift some managerial and technical work off the shoulders of nurses.

Another contributing factor is the lack of appropriate PU policies and guidelines within the units included in the present study. Patients’ forms and records do not include PU assessment forms for high risk patients as a routine. Once a patient develops a PU, nurses tend to use a special form to follow up the progress. However, these forms are similar of the sheets used for other surgical wounds. Hence, PU prevention is not being emphasized upon in daily work routines of nurses in public hospitals.

Interestingly, the current study reveals that nurses working in surgical and orthopedic units scored systematically higher (above 30) than nurses who work in medical and critical care units (below 30). The results corroborate with a Turkish study(26), which surveyed surgical nurses only. The researchers distributed the APuP among 101 nurses working in one university hospital and reported positive attitudes towards PU prevention (80.5%). However, Beeckman and colleagues(5) did not find statistically significant differences between nurses’ attitudes on PU prevention and the units they worked at in Belgian hospitals.
A considerable amount of literature has been published on PU prevention over the last few decades; yet there is little evidence to suggest improvements in the area. It is claimed that nurses’ knowledge is inadequate to prevent PUs development in hospitalized patients and do not follow guidelines. However, there are still some gaps and variations concerning nurses’ knowledge, attitude, and practice relating to PUs prevention and management.

Conclusions
The current study revealed some important trends of nursing knowledge and attitudes towards PU prevention in public hospitals in SA. Age and experience were important factors as senior nurses had better PU prevention knowledge and attitudes scores than younger ones. Surgical and orthopedic nurses also exhibited higher PU prevention measures than ICU and medical units' nurses. In addition, the APuP tool was found to be valid in the current study. These findings show the inadequacy of nurses' knowledge of PUs prevention and management, particularly among Saudi nurses. This poses risks for patients and mandates nursing management to pay more attention to this vital area of nursing practice. Future research should investigate in-depth the hindrances that prevent nurses from optimizing PU care in clinical practice.

Limitations of the Study
There were not enough nurses working in general units with post-graduate qualifications to compare groups and validate results. This is because nurses with higher qualification are generally appointed to managerial positions.

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Conflict of Interest
The authors declared no conflict of interests.

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References
A Series of 5 Case Reports

Unusual Clinical Presentation of Scabies as Urticaria: A Report of Five Cases and Review of Literatures

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Abstract

Backgrounds: Scabies is a global health problem and a highly contagious parasitic disease that is caused by Sarcoptes scabiei mite. Sudan is one of the endemic areas affected. Nocturnal itching and a polymorphic skin rash characterize the disease that is transmitted by direct contact and indirect contact with infected surfaces. History of nocturnal itching and the polymorphic skin rash at the preferred sites of webs of fingers, thighs, and genital areas is the main clinical diagnostic feature. With correct diagnosis the treatment outcome is excellent with anti-scabies medications, whereas, delayed diagnosis increases complications, morbidity and spreading of the disease that could reach an epidemic rate.

Presentations: Five cases of scabies presented with an unusual presentation; two are females (10 and 22 years old) and three are males (50, 70 and 36 years old). All patients presented with itching and urticarial wheals without other primary or secondary skin lesions. Two of them were treated as urticaria with steroids before presentation and their clinical picture got worse. Patients were treated with 5% or 10% sulphur in Vaseline-type ointment for children and adults, respectively, in addition to sulphur soap and oral antihistamines.

Outcomes: Four of the patients were seen one week later in the follow up and they showed excellent response.

Conclusion and recommendation: Scabies should be considered in the differential diagnoses of patients with urticaria. Use of corticosteroids for patients with urticaria should be restricted to conditions where the diagnosis of scabies and other infections had been excluded.

Key words: Sarcoptes scabiei, Scabies, Urticaria, Wheals, Sulphur ointment, Sudan.


Introduction

Scabies is a contagious parasitic skin disease caused by Sarcoptes scabiei mite. It is a global public health problem with 300 million cases diagnosed annually⁴. It is an endemic disease in tropical and subtropical regions. In these areas, it is one of the major six epidermal parasitic diseases afflicting poor communities⁵. The disease is characterized by nocturnal itching and a polymorphic rash of primary and secondary skin lesions due to bacterial infection or eczema. The primary lesions are burrows made by the mites in the stratum corneum for laying eggs and excreting feces. Other lesions are the scratch marks, crustations, dermatitis, nodular lesions and post-inflammatory hyperpigmentation. Scabies can be so severe that it can lead to erythroderma⁵. Diagnosis is often clinical. A helpful test to confirm the diagnosis is demonstration of mites, eggs and feces on skin scraping using KOH (potassium hydroxide), skin biopsy can show characteristic
histopathological findings and mite identification. A molecular investigative approach rather than a simple diagnostic approach, DNA of Sarcoptes scabiei can be identified in epidermal scales by PCR. Increased serum IgE titer and eosinophilia can be demonstrated in some patients. A study held in Brazil in a rural community had identified major risk factors for contracting scabies which included poor crowded housing conditions, low income, illiteracy, sharing of clothes, bedding and personals, and being young.

Asymptomatic patient can spread the disease. Scabies can occur in epidemics in industrialized communities, especially in hospitals, nursing homes and institutional settings. Prognosis is excellent in the classical form of scabies in immunocompetent individuals, but it carries a less favorable outcome in immunocompromised patients and in those with crusted scabies. Symptoms can persist in anxious patients up to one month after successful treatment. Symptoms of scabies are related to proteins of the mite involving both immediate and delayed hypersensitivity reaction. IgE antibodies mediate the rapid symptoms of reinfection. Scabies is associated with high morbidity and complications resulting from the severe nocturnal itching that disturbs sleeping. Secondary infection with group A streptococci may end with acute post-streptococcal glomerulonephritis. Staph pyoderma and cellulitis can also occur in patients with untreated scabies. Thomas et al reported three cases of scabies presenting as urticaria who responded to the anti-scabies γ-benzene hexachloride treatment. Two of them were diagnosed and treated as urticaria overlooking scabies. They highlighted the notion of the occasional association of urticaria with Sarcoptes scabiei mite infestation.

Case presentation

Case 1:

History and Examination: A 10-years old female 5th-grader school pupil from western Sudan residing in Omdurman, had generalized urticarial lesions and nocturnal itching which started one month ago with itching over the limbs and genital area. She received oral antihistamine and soothing agent of zinc oxide prescribed by a general practitioner with minimal improvement. One-week later patient started to develop urticarial wheals which then became generalized she was then seen by a pediatrician who prescribed dexamethasone syrup, calamine lotion and antihistamine. Her condition then started to worsen and she started to develop angioedema with buffy eyes and lip swelling. Itching then became all over the day and she was off schooling for the last week prior to presentation. Patient had no symptoms related to other systems. Her past medical history was unremarkable with one previous hospital admission for tonsillectomy. She was not known allergic to any medication, food, soaps or perfumes. On examination patient was irritable with buffy face, lip swelling and generalized wheals, she was not pale or jaundiced, had no lymph node enlargement and no lower limb edema. Investigations: Urine and stool analysis, Blood film for malaria (BFFM), Widal test for enterica, and stool for H. pylori were all normal. CBC showed eosinophilia. Diagnosis: A diagnosis of scabies was considered depending on the start of symptoms on areas of predilection with nocturnal itching, worsening of the condition with corticosteroids, eosinophilia and also by exclusion of common causes of urticaria from history and investigations. Treatment and Outcomes: Treatment in the form of sulphur 5% in Vaseline-type ointment, sulphur soap and oral antihistamine were prescribed. Dramatic response was achieved, and the patient was back to school after 2 days.

Cases 2 & 3:

Two patients from the same family residing in Kordofan.

Case 2 History and Examination: A 50-years old merchant, known hypertensive for many years on treatment presented with urticarial wheals and nocturnal itching for two weeks and was on sedating antihistamine with minimal improvement. On examination some wheals were scattered over his limbs. The patient was noticed to itch over webs of
fingers. **Investigation:** General investigations were unremarkable. **Diagnosis:** Based on signs and absence of cure with antihistaminic drug, a diagnosis of scabies was suggested. **Treatment and Outcomes:** Sulphur 10% in Vaseline-type ointment, sulphur soap and antihistamine were prescribed with excellent response and one week later was free of symptoms and signs.

**Case 3 History and Examination:** The uncle, a 70-years old male, his condition started as nocturnal itching mainly over his genital area without appearance of any lesions, then itching became day and night but with increasing intensity at night and early morning with no known relieving or aggravating factors. He is not known diabetic or hypertensive and not on any chronic medication. He was on oral antihistamine for his current symptoms. Patient started to develop urticarial wheals over the dorsa of hands and flexures of limbs which then gradually started to involve other sites. On examination, the patient was well not pale or jaundiced no lymphadenopathy or lower limb edema. Patient has very dry skin which can be due to senility. General investigations revealed no abnormality. **Treatment and Outcomes:** Treatment in the form of sulphur 10% in Vaseline-type ointment, sulphur soap and antihistamine were prescribed. Skin emollient in the form of urea 10% was also prescribed for his dry skin. Treatment response was significant, and he presented after one week free of symptoms and signs.

**Case 4:**

**History and Examination:** A 22-years old female medical student, presented with one week history of nocturnal itching associated with flares of urticarial wheals mainly over the extremities and buttocks. There was minimal itching during the day. Systemic review revealed no abnormality and the condition was not associated with fever or any other constitutional symptoms. No family history of skin disease and the patient denied any history of allergic contact. Patient living in a student residency of four students per room with no sharing of clothes blankets or towels. On examination, patient was well with no lesions over the sites of predilection for scabies, even wheals were not present at the time of examination; they used to appear only at night and sometimes early morning. **Investigations:** No investigations were requested. **Diagnosis:** Careful revision of the history pointed to scabies. **Treatment and Outcomes:** Patient responded to sulphur 10% in Vaseline-type ointment, sulphur soap and antihistamine.

**Case 5:**

**History and Examination:** A 36-years old male patient, an employee in a company, presented with a two-month history of nocturnal itching started between the webs of fingers for which he used to take antihistamine tabs with relative improvement at first, but later the condition spreaded to involve the upper limbs and thighs. The patient related the condition to perfumes and soaps. Moreover, he started to omit some foods from his diets with no improvement. Wheals started to develop at night with increasing intensity of itching (Figure 1).

Figure 1: A photograph of case 5 showing wheals of the urticaria.

He was seen by a dermatologist who requested investigations in the form of urine analysis, stool analysis, CBC, ICT (immune-chromatographic rapid test) and BFFM. Investigations were normal apart from insignificant pyuria (5-6/HPF). Treatment prescribed was in the form of antibiotic, antihistamine, calamine lotion, prednisolone tabs 40 mg per day with a schedule of tapering and omeprazole caps 20 mg once daily. After starting the treatment, the patient started to develop
more severe itching and generalized urticarial rash involving even the face. On presentation the patient was anxious with wheals over the face and extremities with no other primary or secondary lesions. 

Investigation: No further investigations were requested. 

Diagnosis: Based on the fact that the itching started as nocturnal, involving a site of predilection of scabies and the condition got worse after treatment with corticosteroids, a diagnosis of scabies was suggested. 

Treatment and Outcomes: Quick tapering of steroids was done and 10% sulphur Vaseline-type ointment and sulphur soap were prescribed. Patient did not come for follow up.

Discussion

Urticaria is a common skin disorder characterized by the appearance of red itchy papules and plaques. It is caused by many factors that can cause mast cell degranulation with subsequent release of inflammatory mediators, e.g., histamine and other vaso-active substances, which can also be released from basophils. Infestation is one of the causes of urticaria; this explains the presence of wheals of urticaria within the polymorphic rash of scabies. The unusual clinical presentation in the reported cases is the presence of urticarial lesions without other primary or secondary lesions usually seen in scabies. Scabies is a highly contagious skin disease that spreads by direct and indirect contact. It represents a real global health problem with a high prevalence rate. Because it can successfully be treated, a proper diagnosis is mandatory. Untreated scabies carries a risk of serious complications to patients, and another risk of spreading the disease leading to an epidemic. In the latter case, a need for mass therapy with a great financial burden will be urgent. The reported cases with an unusual clinical presentation of scabies should be known to health practitioners and to dermatologists in particular. Clinical presentation of scabies as urticaria without other primary and secondary skin lesions is an important issue particularly in those patients treated symptomatically and for urticaria with corticosteroids. Such approach exacerbates scabies and increases chances for the patient being a source of spread of the disease to other family and community members. Sulphur being a cost-effective scabicide medication was used in treating patients, however other options are available. Treatment of contact was considered. Despite the fact that scabies is a disease that is usually diagnosed clinically and the excellent response of patients to anti-scabies treatment, further studies can be done in patients with urticaria to diagnose scabies using KOH, PCR and other confirmatory tests

Conclusions

In patients with urticaria, proper history and examination is needed. Some investigations may be needed to exclude other causes of urticaria if history and examination are not exclusive. Points in the history and examination that should raise the suspicion of scabies include severe itching that is mainly nocturnal, presence of scabies or an itchy dermatosis in the family or a contact, presence of lesions in vulnerable groups and site of itching or wheals that is consistent with areas of predilection of scabies. Exclude scabies and other infections in patients with urticaria before corticosteroid prescription.

Funding

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Conflict of Interest

The authors declared no conflict of interests.

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INTRODUCTION

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*Present/permanent address.* If an author has moved since the work described in the article was done, or was visiting at the time, a ‘Present address’ (or ‘Permanent address’) may be indicated as a footnote to that author’s name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript lower-case letters are used for such footnotes.

**Abstract**

Page 2 of the typescript should be reserved for the abstract which should be presented in a structured format and should not exceed 350 words. The following headings should be included for research articles followed by a colon: a) Background, b) Hypothesis/Objectives; c) Materials/Patients and Methods; d) Results; e) Conclusions (should be data justified). Suitable headings could be used for other types of publications (Case reports, Review articles, etc.).

A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided. Non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

**Keywords**

Immediately after the abstract, provide a maximum of 10 keywords for full papers, or 5 keywords for Short Communications, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, “and”, ”of”). Please use terms from the most current issue of medical subject headings of Index Medicus. The key words should cover precisely the contents of the submitted paper and should give readers sufficient information as to the relevance of the paper to his/her particular field. Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

**Introduction**

Provide adequate background that highlights the importance and gap information of your research point in relation to previous studies but avoiding a detailed literature survey. State the hypothesis or rationale and objectives of the work and a brief description of how you planned to approach them.

**Materials or Patients and Methods**

Provide sufficient detail to allow the work to be reproduced, with details of supplier and catalogue number when appropriate. Methods already published should be indicated by a reference: only relevant modifications should be described.

**Patients and Normal Subjects**

If human participants were used in the experiment please make a statement to the effect that this study has been approved by your Institution Ethics Review Board for your institution's ethical approval with the manuscript), and, that patients or their custodians have signed an informed consent that also states right of withdrawal without any consequences. Sample size should be appropriately calculated. The manuscript should describe how the size of the experiment was planned. If a sample size calculation was performed this should be reported in detail, including the expected
difference between groups, the expected variance, the planned analysis method, the desired statistical power and the sample size thus calculated. For parametric data, variance should be reported as 95% confidence limits or standard deviations rather than as the standard error of the mean. Normal participants and patients criteria, inclusion and exclusion criteria should be stated. Name and address where the work was done and when it was done (time period, from …. to ….) should be clearly stated, too.

**Experimental animals**

When animals were used in the experiments, a local Institutional Ethics Review Board for animal studies should review and approve the experiment and that all animal procedures were in accordance with the standards set forth in guidelines for the care and use of experimental animals by Committee for Purpose of Supervision of Experiments on Animals (CPCSEA) and according to National Institute of Health (NIH) protocol. The precise species, strain, sub-strain and source of animals used should be stated. Where applicable (for instance in studies with genetically modified animals) the generation should also be given, as well as the details of the wild-type control group (for instance littermate, back cross etc.). The manuscript should describe the method by which animals were allocated (randomized) to experimental groups, particularly for comparisons between groups of genetically modified animals (transgenic, knockout etc.), the method of allocation to for instance sham operation or focal ischemia should be described.

**Experimental**

Provide sufficient detail to allow the work to be reproduced. Methods already published should be indicated by a reference: only relevant modifications should be described. Where and when the study was conducted should be stated.

**Results**

Results should be clear and concise. Data should be presented in an appropriately organized tables, figures and/or artworks. The statistical analysis used should be suitable for the objectives of the study and type of data analyzed. Prospective authors are highly advised to consult a biostatistician.

**Footnotes**

Footnotes should be used sparingly. For table footnotes, indicate each footnote in a table with a superscript lowercase letter or add them into the title.

**Graphical abstract**

A Graphical abstract is optional and should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership online. Authors must provide images that clearly represent the work described in the article. Please provide an image with a minimum of 531 x 1328 pixels (h x w) or proportionally more. The image should be readable at a size of 5 x 13 cm using a regular screen resolution of 96 dpi. It is preferable to be inserted at its normal place to the relevant text or otherwise be submitted as a separate TIFF, EPS, PDF or MS Office files.

**Discussion**

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 co-morbidities 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 review give approval? If yes, please provide if requested, 3) De-Identification, has all patient's related data been de-identified?

**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);
· http://www.umin.ac.jp/ctr;
· http://isrctn.org;
· http://www.trialregister.nl/trialreg/index.asp.

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 AUMJ 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): Bitmap 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.

**Color artwork**

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.

**Tables**

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 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-issu 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 up to 10 authors and end longer list by et al. 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 …., 4) It is published put ahead of print, or, it is accepted for publication.

and type 2 diabetic patients from the northern Al-Jouf region of Saudi Arabia: Correlation with the prognostic indices of the disease. International Medical J, 2019 (Accepted publication; http://www.seronjihou.co.jp/imj/).


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).

Journal abbreviations source
Journal names should be abbreviated according to the List of Title Word Abbreviations: http://www.issn.org/services/online-services/access-to-the-ltwal/.

Abbreviations and units
Standard abbreviations as listed in the Council of Biology Editors Style Manual may be used without definition. Use non-standard abbreviations sparingly, preceding their first use in the text with the corresponding full designation. Use units in conformity with the standard International System (SI) of units.

Video data
The journal accepts video material and animation sequences to support and enhance your scientific research. Authors who have video or animation files that they wish to submit with their article are strongly encouraged to include links to these within the body of the article. This can be done in the same way as a figure or table by referring to the video or animation content and noting in the body text where it should be placed. All submitted files should be properly labeled so that they directly relate to the video file’s content. To ensure that your video or animation material is directly usable, please provide the files in one of our recommended file formats with a preferred maximum size of 50 MB. Video and animation files supplied will be published online in the electronic version of your article. Since video and animation cannot be embedded in the print version of the journal, please provide text for both the electronic and the print version for the portions of the article that refer to this content.

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AUMJ encourages authors to create an Audio Slides presentation with their published article as supplementary material. This gives authors the opportunity to summarize their research in their own words and to help readers understand what the paper is about. Authors of this journal will automatically receive an invitation e-mail to create an Audio Slides presentation after acceptance of their paper.

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AUMJ accepts electronic supplementary material to support and enhance your scientific research. Supplementary files offer the author additional possibilities to publish supporting applications, high-resolution images, background datasets, sound clips and more. Supplementary files supplied will be published online alongside the electronic version of your article. In order to ensure that your submitted material is directly usable, please provide the data in one of our recommended file formats. Authors should submit the material in electronic format together with the article and supply a concise and descriptive caption for each file.

Supplementary material captions
Each supplementary material file should have a short caption which will be placed at the bottom of the article, where it can assist the reader and also be used by search engines.

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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.
- All tables (including title, description, footnotes).

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.

In order to maintain this journal’s mission of one-month publication cycle, authors are encouraged to submit the revised manuscript within one week of receipt of reviewer’s comment (in case of minor corrections). However, revised manuscript submission should not go beyond 2 weeks (only for the cases of major revision which involves additional experiment, analysis etc.). Along with corrected manuscript authors will be requested to submit filled a point-by-point answers to the reviewers' comments and any rebuttal to any point raised. The Editor-In-Chief of the journal will have exclusive power to take final decision for acceptance or rejection during any dispute.

Under special circumstance, if the review process takes more time, author(s) will be informed accordingly. The editorial board or referees may re-review manuscripts that are accepted pending revision. Manuscripts with latest and significant findings will be handled with the highest priority so that it could be published within a very short time. The journal is determined to promote integrity in research publication. In case of any suspected misconduct, the journal management reserves the right to re-review any manuscript at any stages before final publication.

Our massage 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”.

Manuscript General Revision Form

The Manuscript Assigned Number and Tittle: ……….

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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