EGYPT - AGEING POPULATION

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Egypt is the most populous country in the Middle East and the third-most populous on the African continent (after Nigeria and Ethiopia). One of the main features of the Egyptian population over the last few decades is the gradual increase in the absolute and relative numbers of older people. This trend is expected to continue over the next decades. The Egyptian census is carried out every 10 years, last one was in 2006. The percent of older people “defined as 60 yrs of age and more” was 4.4% in 1976, 5.66% in 1986, 5.75% in 1996, and rising to 6.27% in 2006, to be 7.2% in 2013. The percentage is projected to be 8.1% in 2016, and 9.2% in 2021, and it is expected to reach 20.8% in 2050. This means that, around 20 million Egyptians will be categorized as elderly by that time, this is a big number that resembles a full nation at some parts of the world. There is an urgent need for the implementation of a national policy for elderly care. Although such policies exist, the effectiveness of existing policies and the role of national committees need to be evaluated in order to revive and mobilize the resources available. Older people, as stakeholders, are expected to participate in the implementation of the national policy through all phases of planning, intervention, and evaluation.

**Demographic Data**

![Demographic Data](image)

Figure (1): Population Estimates & Projections of Egypt (1950-2050)

(Source: world population prospects. Revised 2012)
A distinctive feature of the elderly population throughout the world is the preponderance of women over men “feminization” of population aging (because of longer life expectancy among women). The greater improvement in female life expectancy than that for males will not only result in lower sex ratios for the elderly population as a whole, hence a predominance of females, but for the individual elderly females, greater longevity will very often result in loss of support from spouse, and greater economic deprivations. Current sex ratio in Egypt is 83 men for 100 women.

Figure (2): Population Pyramid of Egypt

*Implications of population ageing and Policy response:*

While population aging represents, in one sense, a success story for mankind (massive survival to old ages has become possible), it also poses profound challenges to public institutions that must adapt to a changing age structure. The rapid ageing of the population can be considered a great threat to the preservation of the society welfare. It presents challenges for public health as well as for economic development especially in developing countries.

Detailed and accurate data on elderly population size and characteristics is the essential first step to describe real situation, to conduct effective development planning and help project future needs of elderly in context with other sectors of population and to determine gaps that need to be closed and achievements that need to be sustained. *Table (1): Egyptian Elderly population and services:*
In addition, there is the migration within the country from rural to urban areas, leaving the elderly behind. This causes variation in the distribution of the aged population within the Egyptian governorates. According to the last Egyptian census, the absolute total number of the elderly is greater in rural areas than urban ones, in spite the fact that their percentage in more in urban (7.18%) than rural (5.6%).

The policy making bodies in Egypt, mainly the Ministry of Health and Population, Ministry of social Solidarity, the universities and the academic institutions have been long acting to cope with the population ageing.

**Social highlights**

The family has been and still the main social institution, which offers support and services to the aged. However, social changes e.g. rural-urban migration with older people left behind, Egyptian women increasingly being employed outside homes,
changing in housing stock (nuclear instead of extended family) and decreasing family size with fewer people in the ‘young generation’ available to take care of larger numbers of people in the ‘old generation’, have created some demands for extra-familial services.

According to the Egyptian constitution, the government is obliged to provide services of medical and social security for aged. Legislation, laws, resolutions and programs on the protection and promotion of seniors’ human rights were laid down for the social and medical security systems aiming to give the elderly the maximum support they need.

Social insurance law: The law adjudicates disbursing security pensions - through the Social Insurance Fund for the governmental sector and the Insurance and Pensions Fund for the public and private sectors in the following cases: (aging, disability and death– work injuries– illness– unemployment– social welfare for pension beneficiaries) a top of this pension beneficiaries’ list come elderly.

The ministry of social solidarity also has laid a number of laws and regulations over the past years supporting the elderly. In 1990 the Ministry laid down the internal regulations of the geriatric clubs, in 1992 set a committee for celebrating with the day of the elderly, and in 1997 established the higher committee for the geriatric care. Law 84/2002 on regulating the work of NGOs and private foundations, allowed elderly to participate in the management of some NGOs, run projects and utilizing their capabilities, it is worth noting here that most NGOs boards in Egypt consist of seniors

Health care services;

Population aging is a great challenge for the health care systems. Although the health status of older people is improving over time now and the life expectancy is increasing, still, with aging, the prevalence of disability, frailty, cancer, and chronic diseases (Alzheimer’s disease, cardiovascular and cerebrovascular diseases, etc.) is expected to increase, especially with the large growth in the oldest old group (+70yrs old) that constitutes 31.73% of the Egyptian elderly. The older the person is, the more likely to face a compounding of multiple health, psychological and social problems that make accurate medical diagnosis and proper medical management difficult.

Elderly people have high risk for functional impairments with inability to perform ordinary activities of daily living (ADL) and activities related to household management termed instrumental activities of daily living (IADL).

In addition to the general health services, whether governmental or private, that are available for the use by the elderly, there are other special services for the older people that have developed in Egypt.
Ministry of Health:

* 13 Two-floor geriatric healthcare centers (offering health care services to elderly people through specialists from different branches) have been set up by the Ministry of Health distributed all over the governorates

*Clinical Diagnostic Service to the dementia (Memory clinic in hospitals) The service included assessment service, counseling and family support.

Governmental Universities:

1- Ain Shams University Geriatric medicine department (The department involves 23 inpatient plus 9 ICU beds, an osteoporosis Unit which offers diagnostic and therapeutic services, and daily outpatient clinic.

It is the only academic institution offering master and doctorate degree in geriatric medicine

2- Alexandria University (Faculty of medicine contain a Geriatrics Unit, geriatrics Outpatient clinic. Postgraduate Program in Geriatric Nursing in the Faculty of Nursing)

3- Helwan University Center for Elderly Social & Health Care (A self-financed unit under the umbrella of the center for community development in Helwan University. Services offered include; 10 inpatient beds, day care services and out-patients clinic.in addition to long term care unit for functionally dependent elderly)

In addition to Cairo University, Assuit University, Tanta University, Suez Canal University and Sohag University which offer either health care services for elderly or educational services for health care professionals.

Other health care settings:

Including private sector, military hospitals and NGOs.

Training programs for health professionals

With the graying of the population, geriatric medicine specialty was developed and well established in Egypt with continuous education and training programs for the health professionals dealing with elderly patients.

Geriatric education

- The Geriatrics and Gerontology Department at Faculty of Medicine - Ain Shams University

The Geriatrics and Gerontology Department at Ain Shams University is the only academic department in Egypt that offers Diploma, Master Degree and Doctoral Degree in geriatric medicine connected to a specialized residency program and clinical training courses.

- Geriatric Physical therapy education

Physical therapy education is available in three Physical therapy colleges. The study of geriatrics is introduced at the third year undergraduate for two terms. Higher degree studies are available to attain higher diploma, Master and Ph.D. degrees.
Geriatric Nursing education
At the colleges of nursing, there is a module in geriatrics nursing both at the undergraduate level as well as postgraduate level at the diploma level, M.Sc., and Ph.D. in geriatric nursing.

The Higher Institute for Public Health-Alexandria university:
This is a postgraduate institute for public health. There are 9 academic departments of which one is the department of Health at old age. This department offers postgraduate training in geriatric health at the diploma level, Master degree level and Ph.D. degree level in public health.

Colleges of Social Services:
In Helwan, and Assiut Universities, they provide Diploma, Master degree and Ph.D. in geriatric care. Also in the other Universities, geriatric care is included in the undergraduate curriculum with training courses and field training.

The Ministry of Health and Population started from 2001 to develop health programs targeting older people within its structure. These include;

- Short term training program for family physicians held with the collaborations of experts from Ain Shams University. These programs are held twice a year and aim to train such physicians to acquire skills in geriatric practice.
- Short term training program for community nurses held with the collaborations of experts from Ain Shams University. These programs aim to train such nurses in geriatric nursing skills.

Training courses for professional caregivers
Different governmental and non-governmental organizations are involved in training of professional caregivers. These programs are very variable in terms of method of training, length of training, and course objectives. Some of these programs would link such training with mechanism to employ the trainee either in long term units or home care programs, but others would just offer the training. Organizations offering these courses include; Geriatric Department at Ain Shams University, college of nursing at Cairo University, CEC, and the Red Crescent.

Recommendations
- Aging is a mass phenomenon, international and regional cooperation is needed for creating supportive community for the aged worldwide. Regional and inter-country dialogues need to be established to lay down joint strategy and plan of action.
- Adopting WHO program “Ageing and Life Course” to reflect the importance of the life-course perspective, in addition to ensuring that older people have adequate security, protection and care when they require assistance.


- Research on ageing and age related issues must be encouraged as an
Important instrument for the formulation of policies on ageing. The results of these researches should be taken into consideration in planning the strategy and policy of health care for ageing

**Main References**

- Census book 2006
- [www.capmas.gov.eg](http://www.capmas.gov.eg)
- [www.elderlyegypt.com](http://www.elderlyegypt.com)
Admission predictors of mortality in Geriatrics intensive care

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Background: Elderly patients are a significant and increasing proportion of ICU patients. With advancing age, the comorbidities critically ill elderly patients have substantial mortality. The early recognition of patients at high risk of mortality is needed to plan care in advance and to control healthcare costs.

Aim: To find out the admission clinical and laboratory predictors of mortality in critically ill elderly admitted to ICU.

Method: A prospective study was performed in Geriatric ICU in Ain Shams University Hospitals including 90 critically ill elderly patients admitted for 24 hours or more. Each patient was subjected to on admission clinical assessment, in addition to laboratory investigations including; measurement of serum levels of Blood urea Nitrogen, Creatinine, Sodium, Potassium, Calcium, Phosphorus, Magnesium, Zinc, Bilirubin, Complete blood count (CBC), CRP and arterial blood gases.

Results: Mortality accounted for 39% of patient’s outcome. Advanced age was significantly associated with increased mortality (p=0.03). The acute stroke as a cause of admission was found to be associated with increased mortality (P= 0.00). Length of ICU stay and the use of mechanical ventilation significantly increased mortality (P= 0.01, P = 0.000) respectively. Tachycardia, tachypnea and deep coma were also found to be associated with increased mortality (P= 0.003, 0.02, 0.000) respectively. Hematocrit, bicarbonate, and sodium levels were significantly lower among the non survivors.

Conclusions: The most important factors independently associated with the high risk of mortality among elderly admitted in ICU are; advanced age, impaired level of consciousness, need for mechanical ventilation, low serum sodium and bicarbonate levels. Early management of hyponatremia and metabolic acidosis is substantial for improving outcome in geriatric ICU.

Keywords: intensive care units, ICU mortality, elderly, hyponatremia, serum bicarbonate.

Introduction:
The elderly population is growing in Egypt, like in many other countries. There were 4,400,000 persons aged 60 and over representing 6.9% of the total population in 2006. The expected percentage of older people may reach 8.9% in 2016 and 10.9% in 2026(1). Life expectancy for Egyptian females was 63.5 years in 1986 increased to 73.6 years in 2006. While, Life expectancy in males was 60.5 years in 1986 and increased to 69.2 years in 2006 (1).

This rapid rise in the elderly population worldwide is paralleled by increase in utilization of health care resources (2). Moreover, elderly will need ICU admission more frequently and their management will be more challenging. Data showed that 55% of all ICU bed-days are occupied by patients aged ≥ 65 years (3). Old age is associated with increased mortality in critically ill patients (4). However, age alone wasn’t a strong predictor for mortality. There is
evidence suggesting that acute physiological impairment and associated comorbidities were predictors of mortality after adjustment of age (5, 6).

The current study was designed to study predictors for mortality in critically ill elderly patients at the time of admission, the early recognition of patients at high risk of mortality is needed to plan care in advance and to control healthcare costs.

Methods:

Study design:

A prospective single center study was conducted to assess the relationship between different clinical and laboratory parameters and clinical outcome for ICU elderly patients. 90 consecutively admitted patients were included in the study. All patients were 60 years and over. Patients with ICU stay of less than 24 hours were excluded. The patients were divided into survival group (those who were discharged from the ICU after improvement) and non-survival group (those who died in the ICU). The study was carried out in the ICU of the Geriatrics and Gerontology Department at Ain Shams University Hospital in Cairo Egypt.

Laboratory assessment:

Blood samples were collected on admission to ICU for estimation of serum levels of Blood urea Nitrogen, Creatinine, Sodium, Potassium, Calcium, Phosphorus magnesium, Zinc, and bilirubin. Most of these laboratory investigations are widely used in intensive care settings; moreover, measuring serum Zinc, Copper and Bilirubin levels gained recent attention as predictors of mortality in elderly population. Complete blood count (CBC), CRP and arterial blood gases were measured also on admission.

Laboratory measures were all performed in Ain Shams University Central Laboratories.

Ethical considerations:

The study methodology was reviewed and approved by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of medicine, Ain Shams University.

Statistical methods:

The collected data were coded, tabulated, revised and statistical analyzed using SPSS program (version 16). Quantitative variables were presented in the form of means and standard deviation. Qualitative variables were presented in form of frequency tables (number and percent). The comparison between quantitative variables was done using t-test. Comparison between qualitative variables was done using Pearson’s Chi square test. Spearman’s correlation coefficient was used for non-parametric correlations. Multivariate logistic regression analysis was used to determine the independent predictors of ICU mortality. Variables that had a significant association with mortality to a value of p<0.05 on univariate analysis were entered into a stepwise logistic regression analysis. Odds ratios (ORs) and 95% confidence intervals (CIs) were used to estimate the independent determinants of ICU mortality. P-values <0.05 were considered significant for all tests. Receiver operating characteristic (ROC) curves were constructed. The area under each ROC curve was calculated to assess the discriminatory ability of the assessed predictors to distinguish whether a patient would die or survive.

Results:

The study included 90 participants 48(53.3%) females and 42(46.7%)
males. All of the participants were ≥ 60 years old with mean age 68.57± 7.4 years (range 60-91 years). the leading cause of admission was neurological emergency in 30 cases (33.3%) (acute stroke 24 (26.6%), Intra cerebral hemorrhage 6 (6.7%)). While the second most common cause was Respiratory failure in 15 cases (16.7%), followed by 10 cases (11.1%) admitted with hepatic encephalopathy, 9 (10%) cases admitted in shock state, 8 (8.8%) cases had myocardial infarction, 8 (8.8%) cases suffered from pneumonia, 4 (4.4%) cases with rapid AF, 2 (2.2%) cases with hypertensive crisis, and 2 (2.2%) cases admitted due to viral encephalitis.

Studying the relation between the cause of admission and mortality revealed that only acute stroke had statistically significant relation to mortality (P= 0.00) (table 1).

Length of ICU stay and the use of mechanical ventilation were found to be associated increased mortality (P= 0.01, P = 0.000) respectively (table 2).

There was no significant relation between different co morbidities and mortality (table 2).

Up on studying the relation between clinical signs on admission and mortality: tachycardia, tachypnea and deep coma statistically were found to be associated with increased mortality (P= 0.003, 0.02, 0.000) respectively (table 3).

The difference between the survivors and the non survivors regarding different laboratory measures were presented in (table 3). Hematocrit, bicarbonate, and sodium levels were significantly different between the two groups.

### Table 1: The relation between the cause of admission and mortality

<table>
<thead>
<tr>
<th>Cause of admission</th>
<th>Survivors n=51</th>
<th>non survivors n=39</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke</td>
<td>6(6.7)</td>
<td>18(20)</td>
<td>0.00*</td>
</tr>
<tr>
<td>Intracerebral hemorrhage</td>
<td>4(4.4)</td>
<td>2(2.2)</td>
<td>0.6</td>
</tr>
<tr>
<td>Myocardial infarctio n</td>
<td>7(7.8)</td>
<td>1(1.1)</td>
<td>0.06</td>
</tr>
<tr>
<td>Hepatic encephal</td>
<td>6(6.7)</td>
<td>4(4.4)</td>
<td>0.82</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>10(11.1)</td>
<td>5(5.6)</td>
<td>0.3</td>
</tr>
<tr>
<td>Uncontrolled hypertension</td>
<td>2(2.2)</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>4(4.4)</td>
<td>4(4.4)</td>
<td>0.6</td>
</tr>
<tr>
<td>Viral encephal</td>
<td>2(2.2)</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Dehydration</td>
<td>2(2.2)</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Rapid</td>
<td>4(4.4)</td>
<td>0</td>
<td>0.074</td>
</tr>
<tr>
<td>Shock</td>
<td>5(5.6)</td>
<td>4(4.4)</td>
<td>0.6</td>
</tr>
</tbody>
</table>

The results of Spearman’s correlation coefficient and multivariate analysis are shown in (table 4, 5) respectively.

Serum sodium and bicarbonate levels are considered routine inexpensive investigations in all critical care facilities.

The Roc curve analysis demonstrated that the probabilities of predicting mortality by measuring serum sodium and bicarbonate on admission were 76.1% and 65% respectively (figure 1).

Serum Bicarbonate level of 15mg/dl had 94.1% sensitivity and 71.8% specificity to predict mortality in critically ill elderly, whereas, serum Sodium level of 120 mg/dl had 96.1%
sensitivity and 79.5% specificity to predict mortality.

**Table 2: characteristic of participants:**

<table>
<thead>
<tr>
<th></th>
<th>Survivors</th>
<th>Non Survivors</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>age Mean(SD)</td>
<td>67.7(6.7)</td>
<td>70.6(7.8)</td>
<td>0.04*</td>
</tr>
<tr>
<td>Body mass index Mean(SD)</td>
<td>22.4(4.6)</td>
<td>23.5(4.9)</td>
<td>0.26</td>
</tr>
<tr>
<td>Length of stay Mean(SD)</td>
<td>4.1(1.5)</td>
<td>9.1(4.6)</td>
<td>0.01*</td>
</tr>
<tr>
<td>APACHEII score Mean(SD)</td>
<td>18(7.07)</td>
<td>21.7(7.07)</td>
<td>0.002*</td>
</tr>
<tr>
<td>Gender Male</td>
<td>25(27.8)</td>
<td>17(18.9)</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>26(28.9)</td>
<td></td>
</tr>
<tr>
<td>Use of mechanical ventilation Yes</td>
<td>6(6.7)</td>
<td>24(26.7)</td>
<td>0.000*</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>45(50)</td>
<td></td>
</tr>
<tr>
<td>Renal disease n(%)</td>
<td>19(21.1)</td>
<td>19(21.1)</td>
<td>0.27</td>
</tr>
<tr>
<td>Liver cirrhosis n(%)</td>
<td>6(6.7)</td>
<td>6(6.7)</td>
<td>0.61</td>
</tr>
<tr>
<td>Diabetes n(%)</td>
<td>23(25.6)</td>
<td>22(24.4)</td>
<td>0.28</td>
</tr>
<tr>
<td>Respiratory disorders n(%)</td>
<td>12(13.3)</td>
<td>8(8.9)</td>
<td>0.73</td>
</tr>
<tr>
<td>Hypertension n(%)</td>
<td>33(36.7)</td>
<td>21(23.3)</td>
<td>0.29</td>
</tr>
</tbody>
</table>

**Discussion:**

The goal of the current study was to evaluate the early predictors of mortality in elderly patients admitted to ICU.

Among the admitted subjects, (43.3%) patients died and the rest survived to ICU discharge. There was a statistically significant difference between survivors and non survivors as regards their age. This agrees with previous studies (7, 8) reported that advanced age was a significant independent risk factor for mortality. However, the advanced age alone shouldn’t preclude optimal ICU treatment provided to elderly patients.

Data from the current study suggests that acute neurological insult was responsible for 22.2% of mortality in critically ill elderly patients followed by type II respiratory failure which accounted for 12.8% of the mortality.

The current study showed that mechanical ventilation was related to increased ICU mortality. 80 % of mechanically ventilated patients died (p= 0.000), this was supported by previous studies (9).

The survivors group had a significantly shorter ICU stay than did non-survivors (p=0.01).This finding agree with Mayr et al., (10) who found that ICU non-survivors did not die early in the course of the disease but primarily in the period of prolonged critical illness. This proves the effects attributed to chronic critical illness.
Table 3: relation between on admission clinical signs, Laboratory results and outcome

<table>
<thead>
<tr>
<th></th>
<th>Survivors</th>
<th>Non</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature °C Mean(SD)</strong></td>
<td>37.7(0.78)</td>
<td>37.8(0.8)</td>
<td>0.41</td>
</tr>
<tr>
<td><strong>Pulse Beats/min Mean(SD)</strong></td>
<td>91.2(13.7)</td>
<td>104.5(16.3)</td>
<td>0.003*</td>
</tr>
<tr>
<td><strong>Respiratory rate breaths/min</strong></td>
<td>24.45(8)</td>
<td>32.67(8.7)</td>
<td>0.02*</td>
</tr>
<tr>
<td><strong>Mean Arterial pressure</strong></td>
<td>85.6(19.8)</td>
<td>81.3(18.4)</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Glasgow coma score</strong></td>
<td>11.9(2.6)</td>
<td>8.7(3.3)</td>
<td>0.000*</td>
</tr>
<tr>
<td><strong>PH</strong></td>
<td>7.3(0.11)</td>
<td>7.4(0.11)</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>PaO2</strong></td>
<td>67(20.6)</td>
<td>65.5(23.5)</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Bicarbonate(mg/dl)</strong></td>
<td>21.6(6.2)</td>
<td>18.9(5.9)</td>
<td>0.02*</td>
</tr>
<tr>
<td><strong>Creatinine (mg/dl)</strong></td>
<td>2.04(1.76)</td>
<td>2.46(2.1)</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>WBCs (1000/uL)</strong></td>
<td>12.3(6)</td>
<td>15(6.7)</td>
<td>0.06</td>
</tr>
<tr>
<td><strong>Hemoglobin (g/dl)</strong></td>
<td>11.9(0.8)</td>
<td>10.4(0.7)</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Hematocrit %</strong></td>
<td>36.4(9)</td>
<td>33.2(6.5)</td>
<td>0.05*</td>
</tr>
<tr>
<td><strong>platelets (1000/uL)</strong></td>
<td>240(18.7)</td>
<td>236.8(22.6)</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Na (mg/dl)</strong></td>
<td>135.7(10.4)</td>
<td>127.3(7.4)</td>
<td>0.000*</td>
</tr>
<tr>
<td><strong>K (mg/dl)</strong></td>
<td>4.8(4.1)</td>
<td>3.9(1)</td>
<td>0.19</td>
</tr>
<tr>
<td><strong>Ca (mg/dl)</strong></td>
<td>8.2(0.5)</td>
<td>8.4(0.5)</td>
<td>0.08</td>
</tr>
<tr>
<td><strong>PO4 (mg/dl)</strong></td>
<td>3.3(0.57)</td>
<td>3.3(0.56)</td>
<td>0.8</td>
</tr>
<tr>
<td><strong>Mg (mg/dl)</strong></td>
<td>2.2(0.29)</td>
<td>2.3(0.2)</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Zn (mg/dl)</strong></td>
<td>82.7(11.4)</td>
<td>79.1(9)</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Cu (mg/dl)</strong></td>
<td>97.67(15.2)</td>
<td>91.9(12.97)</td>
<td>0.062</td>
</tr>
<tr>
<td><strong>bilirubin (mg/dl)</strong></td>
<td>0.6(0.8)</td>
<td>0.5(0.2)</td>
<td>0.3</td>
</tr>
</tbody>
</table>

In the current study 24 (61.5%) of non survivors had hypornatremia, and serum sodium level on admission negatively correlated with ICU mortality. With multivariate analysis serum sodium level on admission was independent predictor for ICU mortality. This is supported by previous studies (11, 12).

Whereas, only 4(4.4%) were found to have hypernatremia. This support previous data that hypernatremia was less common than hypornatremia (13). Despite that the serum levels of different electrolytes (calcium, phosphorus, magnesium, zinc and copper) attracted many researchers to investigate their prognostic value in the ICU settings. Most of the studies measured the occurrence of electrolyte imbalance during the course of critical illness not the baseline levels on admission to ICU.

In Our study there were no significant difference between survivors and non survivors regarding on admission levels of calcium, phosphorus, magnesium, zinc and copper.
Egi et al., 2011 reported that ionized calcium concentration had no independent association with hospital or intensive care unit mortality except for extreme abnormalities of ionized calcium concentrations (14).

Safavi and Honarmand, 2007 (15), reported that hypomagnesemia during ICU stay was associated with poor prognosis. There was significant difference between those with normal and low magnesium levels in mortality rate (55% vs. 35%), the length of ICU (9.16 +/- 0.53 vs. 5.71 +/- 0.55) stay.

Table 4: correlation between different predictors and mortality

<table>
<thead>
<tr>
<th></th>
<th>R</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>0.225</td>
<td>0.033*</td>
</tr>
<tr>
<td>Respiratory rate (breaths/min)</td>
<td>0.269</td>
<td>0.01*</td>
</tr>
<tr>
<td>pulse (Beats/min)</td>
<td>0.309</td>
<td>0.003*</td>
</tr>
<tr>
<td>Length of stay (days)</td>
<td>0.241</td>
<td>0.02*</td>
</tr>
<tr>
<td>Use of mechanical ventilation</td>
<td>0.485</td>
<td>0.000*</td>
</tr>
<tr>
<td>Glasgow coma score</td>
<td>-</td>
<td>0.469</td>
</tr>
<tr>
<td>Serum bicarbonate (mg/dl)</td>
<td>-</td>
<td>0.258</td>
</tr>
<tr>
<td>Serum Sodium (me/dl)</td>
<td>-</td>
<td>0.449</td>
</tr>
<tr>
<td>Hematocrit %</td>
<td>-</td>
<td>0.138</td>
</tr>
<tr>
<td>CRP</td>
<td>0.06</td>
<td>0.5</td>
</tr>
</tbody>
</table>

However, Escuela et al., 2005 (16) study reported that the serum Mg concentrations were similar in both deceased and alive subjects. They found no association between mortality and hypo- or hypermagnesemia determined upon admission, results similar to the current study.

There was no significant difference found between survivors and non survivors regarding Serum zinc and copper levels. This agrees with Cander et al., 2010 (17) who reported that serum zinc and copper levels had no significant relationship with mortality or length of stay in the ICU.

Table 5: multivariate logistic regression analysis:

<table>
<thead>
<tr>
<th>Variable</th>
<th>ß</th>
<th>OR</th>
<th>95% CI</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>-0.14</td>
<td>0.866</td>
<td>0.76-0.97</td>
<td>0.02</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>-0.02</td>
<td>0.98</td>
<td>0.88-1.08</td>
<td>0.67</td>
</tr>
<tr>
<td>pulse (Beats/min)</td>
<td>0.02</td>
<td>1.02</td>
<td>0.98-1.04</td>
<td>0.19</td>
</tr>
<tr>
<td>Length of stay</td>
<td>0.17</td>
<td>1.13</td>
<td>0.93-1.35</td>
<td>0.15</td>
</tr>
<tr>
<td>Use of mechanical ventilation</td>
<td>3.04</td>
<td>0.04</td>
<td>0.00-0.06</td>
<td>0.00</td>
</tr>
<tr>
<td>Glasgow coma score</td>
<td>-0.23</td>
<td>0.73</td>
<td>0.63-0.83</td>
<td>0.03</td>
</tr>
<tr>
<td>Serum bicarbonate (mg/dl)</td>
<td>-0.16</td>
<td>0.84</td>
<td>0.78-0.91</td>
<td>0.00</td>
</tr>
<tr>
<td>Serum Sodium (me/dl)</td>
<td>-0.11</td>
<td>0.89</td>
<td>0.84-0.95</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Fu and Zang, 2012 (18) reported that the serum phosphate level had a prognostic value as a predictor for mortality. Like other studies, they measured the hypophosphatemia that developed during the course of the illness not the serum level during admission.

Figure 1: ROC curve for detection of mortality by serum Sodium and bicarbonate on admission.
Area under the curve for sodium 0.761 95% CI (0.662-0.86), while the area under the curve for bicarbonate 0.650 95% CI (0.534-0.767)

As in other studies (19,20), the APACHE II score in the current study was accurate to predict mortality in the critically ill elderly subjects. In the current study the mean APATCHE II score was higher among the non-survival group with high statistical significant difference.

Although the current study is a single-center study, but it detected the early predictors for mortality in elderly patients admitted to ICU. However, it lacks the analysis of the factors that can influence patient outcome during the course of an ICU stay, future studies for evaluation of changes in patient status over time is needed.

Conclusions
Elderly patients with acute neurological insult had a higher mortality when compared to other emergency causes of ICU admission. The advanced age, Mechanical ventilation, low serum sodium and bicarbonate levels on admission are independent predictors of mortality in elderly critically ill patients. Early management of hyponatremia and metabolic acidosis is substantial for improving outcome in geriatric ICU.

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Highlights on Diabetes Mellitus in Older Adults

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Background

It is estimated that by the year 2030, there will be 8.6 million adults with diabetes in Egypt, making it the country with the tenth largest population of diabetics in the world [1]. The prevalence of diabetes rises dramatically with age in both sexes; it reaches almost 20% among females aged 50-59 [2]. The burden of diabetes in adults is often described in terms of its impact on working-age, while in older adults it is linked to decreased functional status, institutionalization, and mortality [3]. Older persons and/or those with multiple comorbidities have often been excluded from randomized controlled trials of treatment despite having the highest prevalence of diabetes [4].

Can diabetes mellitus be prevented?

Diabetes mellitus could be prevented in older adults. The American Diabetes Association (ADA) [5] recommends testing to detect type 2 diabetes and prediabetes in the following conditions:

- Asymptomatic people who are overweight or obese (BMI ≥25 kg/m²) and who have one or more additional risk factors for diabetes (physical inactivity, first-degree relative with diabetes).
- High-risk race/ethnicity.
- Hypertension.
- HDL cholesterol level < 35 mg/ and/or a triglyceride level > 250 mg/Dl.
- Other clinical conditions associated with insulin resistance (e.g., severe obesity, acanthosis nigricans).
- History of cardiovascular disease (CVD).

In those without these risk factors, testing should begin at age 45 years. If tests are normal, repeating testing at least at 3-year intervals is reasonable. To test for diabetes or prediabetes, the Hemoglobin A1C (A1C) (5.7–6.4%), Fasting Blood Sugar (FPG) 100 mg/dL to 125 mg/dL, or 75-g 2-h (Oral Glucose Tolerance test) OGTT 140 mg/dL to 199 mg/dL are appropriate. In the Diabetes Prevention Program (DPP), which is the largest trial to date, 20% of participants were aged 60 years at enrollment. These participants seemed to have more efficacies from the lifestyle intervention than younger participants, but did not appear to benefit from metformin [6].

Diagnosis of diabetes mellitus in elderly [7]:

- A1C ≥ 6.5%. The test should be performed in a laboratory using a method that is certified and standardized to the Diabetes Control and Complications Trial (DCCT) assay; or
- FPG ≥126 mg/dL. Fasting is defined as no caloric intake for at least 8 h; or
- 2-h plasma glucose ≥200 mg/dL during an OGTT). The test should be performed as described by the WHO, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water; or
- In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dL
- In the absence of unequivocal hyperglycemia, result should be confirmed by repeat testing.

Treatment Goals for Glycemia, Blood Pressure, and Dyslipidemia in Older Adults with Diabetes:

The consensus report of the American Geriatric Society [4] regarding diabetes in older adults sets treatment goals according to the patient’s characteristics and health status.

- For healthy elderly (Few coexisting chronic illnesses, intact cognitive and functional status):
  Reasonable A1C Goal is <7.5% (A lower goal may be set for an individual if achievable without recurrent or severe hypoglycemia or undue treatment burden), FPG or prandial (90-130mg/dl), Bedtime glucose (90-150mg/dl), Blood Pressure < 140/80, Lipids (statins unless contraindicated or not tolerated).

- For Complex/intermediate elderly (Multiple coexisting chronic illnesses or 2+ instrumental ADL impairments or mild to moderate cognitive impairment):
  A1C < 8.0%, FPG or pre-prandial (90-150mg/dl), Bedtime glucose (100-180mg/dl), Blood Pressure < 140/80, Lipids (statins unless contraindicated or not tolerated).

- Very complex/poor health elderly (Long-term care or end-stage chronic illnesses or moderate to severe cognitive impairment or 2+ ADL dependencies):
  A1C < 8.5%, FPG or preprandial (100-180mg/dl), Bedtime glucose (110-200mg/dl), Blood Pressure < 150/90, Lipids (Consider likelihood of benefit with statin(secondary prevention more than primary)).

The U.S. Department of Veterans Affairs and the U.S. Department of Defense (VA/DOD) Recommend glycemic goals based on comorbidity and life expectancy as follows [8]:

- Patient with either none or very mild microvascular complications, free of major concurrent illnesses and has a life expectancy of at least 10–15 years, should have an A1C target of <7%, if it can be achieved without risk.

- Patient with longer duration of diabetes (more than 10 years) or with comorbid conditions and who requires a combination medication regimen including insulin should have an A1C target of <8%.

- Patient with advanced microvascular complications and/or major comorbid illness and/or a life expectancy of less than 5 years is unlikely to benefit from aggressive glycemic control and should have an A1C target of 8–9%. Lower targets (<8%) can be established on an individual basis.

Hypoglycemic drug use in elderly:

- It should be individualized yet Metformin is often considered the first-line therapy in type 2 diabetes due to its low risk for hypoglycemia. The dose should be reduced if estimated glomerular filtration rate (eGFR) is 30–60 mL/min, and the drug should not be used if eGFR is <30 mL/min [9].

- Sulfonylureas carry the risk of hypoglycemia which is problematic for older patients. Glyburide has the highest hypoglycemia risk and should not be prescribed for older adults [10].

- Glinides, α-Glucosidase inhibitors, Dipeptidyl peptidase-4 inhibitors, Glucagon-like peptide-1 agonists target...
more the postprandial hyperglycemia [4].
- Insulin therapy can be used in selected older adults with type 2 diabetes with similar efficacy and hypoglycemia risk as in younger patients. However, the risk of hypoglycemia must be considered before using an insulin regimen to achieve an aggressive target for hyperglycemia control [4]. Elderly owe independent risk factors for hypoglycemia which include hospital discharge within the prior 30 days, advanced age, black race, and use of five or more concomitant medications [11]. Finally every diabetic elderly should have consultation regarding nutrition and physical activity and should be screened for chronic diabetes complications, cognitive impairment, functional impairment, falls, polypharmacy, depression, visual and hearing impairment [4].

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Vitamin D and Geriatric syndromes: Possible links

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Background: Vitamin D deficiency is a very common problem among elderly population. Extra-skeletal functions of vitamin D are an interesting new area of research since the discovery of vitamin D receptors in different extra-skeletal organs and possible links to common geriatric syndromes and problems have been examined. This presentation reviews current knowledge regarding vitamin D possible links to common geriatric syndromes.

Introduction:

Since the autocrine/paracrine functions of vitamin D are becoming increasingly widely recognized with several organs possessing the enzymatic machinery to convert 25-hydroxyvitamin D [25(OH)D], to the active form, 1,25-dihydroxyvitamin D [1,25(OH)D], has provided new insights into the function of this vitamin (1-2). Among other tissues; prostate, breast, colon, brain, and immune cells are the most known tissues that possess vitamin D receptors (1). Not only that its receptors are in many tissues but also it controls the function of over 200 genes, including genes responsible for the regulation of cellular proliferation, differentiation, apoptosis, and angiogenesis (3).

Although there is no consensus on optimal levels of 25(OH)D as measured in serum, vitamin D deficiency is defined by most experts as a 25(OH)D level of less than 20 ng/ml (4). Vitamin D deficiency is very common especially among elderly populations with reports of prevalence as high as 84% in some countries (5).

Since prevalence is even higher among elderly with comorbidities it is very possible that vitamin D could be associated with common geriatric syndromes.

Geriatric syndromes possibly linked to vitamin D deficiency:

Frailty:

25(OH)D deficiency is associated with debilitating chronic diseases and age-related conditions that may influence physical functioning and hence relation to frailty was considered in research (7).

The largest of these studies was that of Wilhelm-Leen and colegues (2010). Using data from the Third National Health and Nutrition Survey (NHANES III), 25(OH) D deficiency, defined as a serum concentration <15 ng/mL), was associated with a 3.7-fold increase in the odds of frailty amongst whites and a four-fold increase in the odds of frailty amongst non-whites (7).

Also, a cross-sectional study on a total of 1,504 community-dwelling men aged 60-79 years- using multinomial logistic regression- found lower levels of 25(OH)D were associated with being pre-frail and frail even after adjustment for confounders. Among the five frailty phenotypes (FP) criteria, only sarcopenia was not associated with 25(OH)D levels (8). Association was low muscle mass was examined again in the cross-sectional study of Dupuy and colleagues using data from the EPIDOS study. The results again showed
that no association between low muscle mass and low dietary intakes of vitamin D (9).

Longitudinal studies are needed to examine if vitamin D supplementation to vitamin D deficient frail persons with sarcopenia has any effect on either frailty status or muscle mass.

**Incontinence and pelvic floor dysfunction:**

Urinary continence requires coordinated muscle function with relaxation of the bladder detrusor allowing the bladder to fill, followed by detrusor contraction with concomitant sphincter relaxation at a time controlled by the individual. Since bladder musculature possesses vitamin D receptors and responds to vitamin D analogues, vitamin D deficiency perhaps could influence bladder dysfunction (10-11).

Pelvic floor dysfunction in females is common, and its prevalence increases with age. The prevalence of urinary incontinence (UI) varies by definition but has been reported to range between 13% and 49% (12-16).

A relation between osteoporosis and pelvic floor muscles function was suggested in research (17) and so the idea to study its relation to vitamin D deficiency only seems rational.

Prospective cohort or randomized studies investigating the relationship between vitamin D nutritional status and pelvic floor disorders symptoms are lacking but observational studies show a possible link. One study including more than 1800 adult women showed that as many as 82% of the participants had low levels of vitamin D. However those who had pelvic floor disorders and/or incontinence had levels significantly lower than those of the rest of the group (18).

Links to fecal incontinence have been examined in a small cohort study of patients with fecal incontinence, it was shown that all patients had hypovitaminosis D (60% had vitamin deficiency and 40% with relative vitamin D insufficiency). The mean vitamin D level in patients with fecal incontinence was 17 ng /ml (range 5.4–22.2 ng /ml) with a significantly higher prevalence than the general population (19).

Longitudinal studies are still lacking but two case studies are available; the first was a 78-year-old woman with symptoms of urge incontinence who had vitamin D deficiency [25(OH)D <10 ng/ml] who claims her UI resolved with vitamin D supplementation. The second reported case was a 59-year-old woman with stress urinary incontinence symptoms who had a 25(OH)D level of 13 ng/ml. However, these symptoms resolved even before normalization of her serum vitamin D level (20).

**Dementia and cognitive impairment:**

It has only been in the last decade or so that vitamin D has been thought to function as a neuro-steroid (21) and research yielded a large amount of knowledge regarding vitamin D and its previously unknown role in brain development and function. For example, the distribution of the vitamin D receptor (VDR) and the enzyme associated with the synthesis of the active form of the hormone 1α-hydroxylase (CYP27B1) has been mapped in human brain (22).

Hypovitaminosis D has been associated with cognitive decline in the elderly, Parkinson’s disease and Alzheimer’s disease (23-26). In a large prospective study of cognitive decline, aging and 25OHD3, cognitive decline and the rate of decline were increased in subjects
severely deficient in 25OHD3 (<25 nM) (25). However, it is unclear if associations between hypovitaminosis D and psychiatric disorders are causative or circumstantial, but there is some evidence for symptom improvements with vitamin D supplementation (24).

Recently, in a cross-sectional and longitudinal analysis of a prospective cohort of 6,257 community-dwelling elderly women followed for 4 years, a lower serum 25(OH) D level at baseline predicates cognitive decline during the 4.6 years follow-up (27).

Another follow-up study on 498 community-dwelling elderly females found that low baseline vitamin D level, as well as low vitamin D intake was predictors of Alzheimer’s dementia but not other types of dementia (28).

Depression:

Vitamin D has also been linked to depression which is one of the most common mental disorders in elderly populations. Stumpf and colleagues first suggested that vitamin D may contribute to the higher prevalence of seasonal affective disorders at high latitudes (29). However to date, the results of small trials of vitamin D supplements in seasonal affective disorder have been inconclusive (30-32).

Even with large cross-sectional studies the results are conflicting. A number of cross-section studies have reported association between low vitamin D and depression (33-35). While other cross-sectional studies have failed to find such an association when controlled for potential confounding factors (36-38).

The influence of potential confounds has been examined in a larger observational study from Europe on 1283 community-dwelling elderly (65–95 years), it was reported that those with lower 25(OH)D levels were at significantly increased risk of both minor and major depression. The severity of symptoms was significantly associated with decreased serum 25(OH)D levels and increased serum PTH levels (39).

Another large, population-based survey of the elderly (n = 2070 participants, aged 65 years and older) reported a significant increased risk of depressive symptoms in those with vitamin D deficiency (40).

A 6-year prospective study of 954 adults aged 65 years and older examined the association between low vitamin D at baseline and subsequent (incident) depression (41). Those with 25(OH)D less than 50 nM at baseline (compared with those with higher levels) experienced significantly higher scores on measures of depression at 3 and 6 year follow-up. The study was able to adjust for a range of potential confounds, and examined the association between the variables of interest in a prospective fashion, thus lending weight to the hypothesis that low vitamin D may contribute causally to depression. A reanalysis of the Women’s Health Initiative examined the association between dietary vitamin D intake at baseline in a very large sample (n = 81,189). Those with the highest dietary intake has lower scores on depressive symptoms at the 3 year follow-up, and this finding persisted after adjustments for a range of potential confounding factors (42).

Recommended doses of vitamin D supplementation:

Vitamin D supplementation intake recommendations are controversial based upon the targeted condition. To address the debate over how much vitamin D supplementation to recommend, the Institute
of Medicine (IOM) published the 2011 report on dietary reference intakes for vitamin D to be 600 IU/day for ages 1 to 70 years, and 800 IU/day for those older than 71 years in musculoskeletal conditions (43). Nevertheless, there is ample evidence that vitamin D doses above these recommendations are well tolerated (44-45).

Yet; due to the lack of conclusive level I evidence, the IOM concluded that recommendations for vitamin D supplementation to address any other condition-specific goal must await larger epidemiologic or randomized studies (43).

**Screening potential:**

Several problems are inevitably connected with the use of plasma 25(OH)D to assess vitamin D status. One important problem is that plasma 25(OH)D level depends on unchangeable ecological factors (season, local weather conditions and latitude), modifiable individual lifestyle factors (clothing, dietary habits, etc.), and unmodifiable individual factors (race, pigmentation, skin thickness and age) (46). So, most guidelines for elderly population recommend vitamin D and calcium supplementation for the elderly without previous testing of vitamin D status (43).

Future studies of feasibility of testing vitamin D status in risk groups are therefore mandated.

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Luteinizing Hormone in Frail Elderly Individuals

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Departments of Geriatrics1, Clinical Pathology2 and Neurology3 - Faculty of Medicine-Ain Shams University

Abstract:

Background: The term "frailty" has been used clinically as a global concept to describe a condition, common in the old, of impaired strength, endurance, and balance, vulnerability to trauma and other stressors, and high risk for morbidity, disability, and mortality. A variety of factors may contribute to frailty or to one or more of its specific features. These include inflammatory, musculoskeletal, cardio respiratory, metabolic, hematologic, neurologic, immunologic and endocrine factors. Hormones important to the development of frailty that has been proposed include testosterone, luteinizing hormone (LH) and dehydroepiandrosterone (DHEA). Objective: to study the association between LH level and frailty among the elderly

Method: A case control study was carried out. The case group included 80 Frail elderly subjects selected according to the American Geriatric Society Criteria; whereas 80 non-Frail elderly subjects were selected as the control group. Each participant was subjected to Comprehensive Geriatric Assessment and laboratory assessment of luteinizing hormone. Results: LH level was lower in frail subjects compared to non frail. Lower levels were significantly correlated with increased degree of dependency in both frail males and females. Conclusion: Luteinizing hormone level was lower among frail elderly. Further studies are needed to confirm such an association and to plan clinical practice accordingly.

Key words: Frailty, Luteinizing hormone, independence.

Introduction:

The term frailty is frequently used within the geriatrics world to describe patients who are in poor overall health, vulnerable to the ill effects of a variety of environmental stressors, and are further at high risk for worsened morbidity, worsened disability, and mortality. Clinical researches demonstrate that these patients, are heavy users of medical services, and have a tough lot in life.

Despite the ability to conceptualize and study these patients in the aggregate, a simple consensus definition and criteria for frailty has remained elusive. The elusiveness of the definition of frailty reflects not only the challenges in defining a clinical syndrome where the exact etiology and path physiology are unknown but also the challenges of defining the boundaries of a syndrome that has medical, functional, and social components.

However, researchers have, for the most part, disentangled frailty from disability in basic activities of daily living (ADL) with many authors considering the...
defect in ADL a major component of clinical criteria of frailty\(^{(2)}\).

There is also a strong rationale for the inclusion of additional components such as cognition and mood, which may be affected by the same biological processes that lead to the manifestations of “physical” frailty. Several mechanisms have been hypothesized to have an important role in the development of frailty, including inflammation, coagulation and oxidative stress. Many authors implicate age-related hormonal changes to be directly or indirectly involved in the development of the frailty syndrome. Alterations in hypothalamic-pituitary-gonadal, hypothalamic-pituitary-adrenal (HPA) and growth hormone-insulin growth factor I (GH-IGF-I) axes that accompany aging have been associated with frailty \(^{(3)}\).

Hormones that have been proposed to be important to the development of frailty include; testosterone, luteinizing hormone and dehydroepiandrosterone (DHEA) \(^{(4)}\). As we age, changes naturally occur in the way that body systems are controlled. Some target tissues become less sensitive to their controlling hormone. The amount of hormones produced may also change. Hormones are also broken down (metabolized) more slowly. Blood levels of some hormones increase, some decrease, and some are unchanged. A number of studies have assessed the hormonal changes associated with frailty including Luteinizing hormone (LH) with conflicting results.

**Aim of the study:** the aim of the current study is to evaluate the association between LH level and frailty in the elderly.

### Methods

**Participants and study design**

This was a case control study enrolling 160 elderly subjects 60 years and above all being recruited from outpatient clinics of the Geriatrics and Gerontology department of Ain Shams University Hospitals. The selected group was subdivided into 2 groups:

**First group:** 80 Frail elderly subjects selected according to the American Geriatric society criteria \(^{(5)}\) as follows:

- Individuals who have severe disability in two or more of the following domains or moderate disability in at least three or more of these domains: physical health, mental status, functional status, socio-economic status and residential environment; or
- Individuals who are disabled in two instrumental activities of daily living (IADL) and one ADL; or
- Individuals aged 85 years or older; or
- Older individuals who are homebound; or
- Older individuals with mental disorders such as dementia; or
- Older individuals with communication disorders; or
- Individuals with significant sequelae of multiple chronic conditions such as arthritis, hypertension, heart disease, diabetes, osteoporosis, fracture, stroke, cancer (currently active), dementia, and Parkinson's disease

**Second group:** 80 non-frail elderly as control group
All participants were subjected to comprehensive geriatric assessment which includes:

- Full history taking and physical examination.
- Assessment of the cognitive status by using the Arabic version \(^{(6)}\) of Mini mental state examination (MMSE) \(^{(7)}\). MMSE is one of the most commonly used cognitive screening measures being quick and easy to administer. It includes specific questions related to attention, orientation, memory, calculation and language.
- Assessment for depression by using the Arabic version \(^{(8)}\) of the Geriatric Depression scale (GDS) \(^{(9)}\). It is the 15-item GDS which is a well–validated tool often used to screen for depressive symptoms in older individuals. This measure is scored based on a 15-points scale and impairment is indicated by a score of 5 or higher.
- Assessment of the daily living activity by using: activity of daily living (ADL) \(^{(10)}\) and instrumental activity of daily living (IADL) \(^{(11)}\). Questionnaire of both ADL and IADL are informant- based assessment of functional disabilities. The ADL questionnaire measures functionality in 5 areas: bathing, toileting, grooming, dressing and eating. While the IADL questionnaire measures functionality in traveling, shopping, house work, managing finances, using the telephone and taking medications.

**Lab testing**

Serum luteinizing hormone was measured (in mIU/ml) using sandwich enzyme immunoassay technique (Human luteinizing hormone ELISA kit) the test is based on phase enzyme – linked immunosorbent assay

**Ethical considerations**

The study was approved by the Ethical Committee of the Faculty of Medicine, Ain Shams University. Informed consent was obtained from participants, their nearest relatives, or both depending on the patient’s cognition.

**Statistical analysis**

Data collected was revised, coded, tabulated and introduced to PC for statistical analysis. All data manipulation and analysis was performed using the 17th version of SPSS (Statistical Package for Social Sciences). Qualitative data was presented in the form of frequency tables (number and percentage). Quantitative data was presented in form of mean ± standard deviation and range. Pearson Chi-squared was used with correction to test the association between 2 qualitative variables. Independent sample-t test was also used to compare two groups with quantitative continuous variables. P value was always set as significant at 0.05.

**Results:**

The current study enrolled 160 elderly subjects 60 years and above, 80 frail elderly and 80 sex and age matched non-frail elderly totally independent in ADL, IADL and had MMSE >24 . The mean age of the studied group was 67.86±6.5 years.

As regards the mean LH level in males there was no significant difference statistically between cases (10.2mIU/ml) and controls (10.5mIU/ml). There was a lower mean LH level among female cases (22.6mIU/ml) compared to female
controls (38.4 mIU/ml) and the difference was significant statistically (P<0.05). (Table 1)

Table (1) Comparison between frail individuals and controls as regards mean LH level:

<table>
<thead>
<tr>
<th></th>
<th>Frail Mean SD</th>
<th>Non-frail Mean SD</th>
<th>t</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>10.2</td>
<td>10.5</td>
<td>0.1</td>
<td>&gt;0.05 NS</td>
</tr>
<tr>
<td></td>
<td>11.7</td>
<td>6.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>22.6</td>
<td>38.4</td>
<td>2.6</td>
<td>&lt;0.05 Sign</td>
</tr>
<tr>
<td></td>
<td>31.0</td>
<td>26.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There was highly significant negative correlation between LH level and degree of dependency in ADL with lower levels of LH was significantly correlated with higher degree of dependency in ADL in frail female individuals, while no other significant correlation could be detected between LH level and any of the studied parameters including age, male gender, depression and cognitive impairment (Table 2)

Table(2) Correlation between LH level & Age, ADL, IADL, MMSE and GDS score among frail individuals:

<table>
<thead>
<tr>
<th></th>
<th>Males r</th>
<th>P-value</th>
<th>Females r</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.86</td>
<td>0.50</td>
<td>-0.60</td>
<td>0.60</td>
</tr>
<tr>
<td>ADL</td>
<td>-0.05</td>
<td>0.241</td>
<td>-0.399</td>
<td>0.00</td>
</tr>
<tr>
<td>IADL</td>
<td>-0.234</td>
<td>0.05</td>
<td>-0.389</td>
<td>0.00</td>
</tr>
<tr>
<td>MMSE</td>
<td>0.140</td>
<td>0.25</td>
<td>0.155</td>
<td>0.13</td>
</tr>
<tr>
<td>GDS</td>
<td>0.001</td>
<td>0.99</td>
<td>-0.141</td>
<td>0.17</td>
</tr>
</tbody>
</table>

In studied group, (57.5%) of frail patients had Hypertension, (36.3%) had ISHD, (27>5%) had chronic liver diseases, (18.8%) had osteoporosis and (46.3%) had Diabetes mellitus but the difference was not statistically significant, while (22.5%) had cerebrovascular stroke but the difference was highly statistically significant (Table 3)

Table(3) Comparison between the two groups as regards chronic diseases:

<table>
<thead>
<tr>
<th></th>
<th>Frail</th>
<th>Non-frail</th>
<th>X²</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>N=46</td>
<td>N=51</td>
<td>0.6</td>
<td>&gt;0.05 NS</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>N=15</td>
<td>N=24</td>
<td>7.7</td>
<td>&gt;0.05 NS</td>
</tr>
<tr>
<td>DM</td>
<td>N=37</td>
<td>N=29</td>
<td>1.6</td>
<td>&gt;0.05 NS</td>
</tr>
<tr>
<td>ISHD</td>
<td>N=29</td>
<td>N=28</td>
<td>0.02</td>
<td>&gt;0.05 NS</td>
</tr>
<tr>
<td>Cerebrovascular stroke</td>
<td>N=18</td>
<td>N=4</td>
<td>10.3</td>
<td>&lt;0.01 HS</td>
</tr>
<tr>
<td>Chronic liver</td>
<td>N=21</td>
<td>N=4</td>
<td>0.03</td>
<td>&gt;0.05 NS</td>
</tr>
<tr>
<td>Renal impairment</td>
<td>N=14</td>
<td>N=4</td>
<td>6.2</td>
<td>&lt;0.05 NS</td>
</tr>
<tr>
<td>Anemia</td>
<td>N=10</td>
<td>N=8</td>
<td>0.2</td>
<td>&gt;0.05 NS</td>
</tr>
</tbody>
</table>

Discussion:

Frailty is considered highly prevalent in old age and to confer high risk for falls, disability, hospitalization, and mortality. Frailty has been considered synonymous with disability, co morbidity, and other characteristics, but it is recognized that it may have a biologic basis and be a distinct clinical syndrome. A number of studies have assessed the hormonal changes associated with frailty including LH. There was a great conflicting results as regards LH level in
elderly in general and its relation to frailty which may be explained by the complexity of regulatory mechanisms of the hypothalamic–pituitary gonadal axis which highly altered with age, in addition to the wide variability in the interpretation of the nature of frailty. Frailty criteria give heterogeneous results when applied in clinical practice. The prevalence of frailty in a sample of 125 elderly people ranged from 33% to 88%, depending on the criteria used (1).  

A study found that serum LH levels significantly increase in independently living elderly men aged 73-94 years and positive significant relation existed between LH level and Stanford Modified Health Assessment Questionnaire (MHAQ) score as a parameter of frailty in which high score means low ability (14). On the other hand, another study found Frailty index to be associated with increase in LH (15).  

In the current study, LH level was lower among the frail elderly but with statistically significant difference among females only. In a study conducted a group of 112 non frail postmenopausal women (mean age 67.6, range 50-88 years) was evaluated, they concluded that there is highly elevated postmenopausal level of LH hormone (16). Although another study found that the level of Luteinizing hormone (LH) increase with age, but the current study did not find correlation between the level of LH and age. Narrow age range of the studied group can explain such variation in results. Similarly, another study found that LH did not change among age groups (18).  

Studying the association between LH level and other studied parameters of frailty demonstrated that there was negative correlation between LH level and ADL and IADL statistically significant among frail females but not among males. A study done found that frailty among 4,000 community dwelling elderly men and women over 65 years to be associated with physical inactivity (19).  

In the current study there was no significant correlation between LH level and cognitive impairment (MMSE) in both males and females frail elderly. In a study done (20) in which patients were diagnosed on clinical grounds and screened by the mini mental score examination (MMSE), and LH was measured; the results showed that there was no significant difference in the level of LH hormone between cases and controls. Also there was no significant correlation between LH level and depression (GDS) in both males and females frail elderly but this was not the case in a study done (21) where they measured serum LH in 46 postmenopausal frail female and matched normal controls, and they showed high LH concentrations in depressive females and positive correlation between the LH measures and severity of depression.  

In the current study, 38.8% of frail cases had more than 3 co morbidities, As regard major geriatric syndromes cerebrovascular stroke was more among frail patients and the difference was statistically significant while Hypertension, osteoporosis and ISHD there was no statistical significant difference between the 2 groups.
Studies assessing the association of LH with diseases found contradicting results. LH was found to be higher among hypertensive thrombotic males and among non frail men with osteoporosis. On the contrary, Wranicz et al; (2005) suggested high level of LH to be protective against coronary artery disease.

Conclusion and Recommendation:
Based on the results of the current study, lower level of luteinizing hormone is significantly correlated with degree of dependency and no other significant correlations with any other studied parameters of frailty had been detected.

One of the limitations of the current study is the use of clinical rather than path-physiological definition of frailty, so further studies using path physiological definitions is warranted to clarify this topic and to put down definite criteria of frailty.

References:


Modes of intra-articular injection of Mesenchymal Stem Cells for treatment of Osteoarthritis

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Abstract
Despite the high prevalence and morbidity of osteoarthritis (OA), an effective treatment for this disease is currently lacking. Restoration of the diseased articular cartilage in patients with OA is, therefore, a challenge of considerable appeal to researchers and clinicians. Techniques that cause multipotent adult mesenchymal stem cells (MSCs) to differentiate into cells of the chondrogenic lineage have led to a variety of experimental strategies to investigate whether MSCs instead of chondrocytes can be used for the regeneration and maintenance of articular cartilage. MSC-based strategies should provide practical advantages for the patient with OA. These strategies include use of MSCs as progenitor cells to engineer cartilage implants that can be used to repair chondral and osteochondral lesions. Delivery of MSCs might be attained by direct intra-articular injection or by graft of engineered constructs derived from cell-seeded scaffolds. Promising experimental and clinical data are beginning to emerge in support of the use of MSCs for regenerative applications.

Key points: osteoarthritis, MSCs, intra-articular injection.

Introduction:
Osteoarthritis (OA), the most common form of joint disease, is characterized by degeneration of the articular cartilage and, ultimately, joint destruction.¹ Currently, OA is a major cause of disability in the elderly; the prevalence of this disease is expected to increase dramatically over the next 20 years with an increasingly aged population.² The burden of OA is exacerbated by the inadequacies of current therapies. Non-pharmacologic and pharmacologic treatments are used for early and moderately early cases of OA, but protection of articular cartilage has so far not been convincingly shown.³, ⁴ Surgical intervention is often indicated when the symptoms cannot be controlled and the disease progresses.⁵ Whether arthroscopic lavage and/or debridement can provide symptomatic relief is unclear.⁶ Methods for the repair of articular cartilage lesions include the transplantation of osteochondral grafts, micro fracturing, and autologous chondrocyte implantation, with or without the assistance of a scaffold matrix to deliver the cells;⁷⁻¹² however, all of these techniques are limited to the repair of focal lesions.¹³ Consequently, patients with OA are currently excluded from these treatments. The challenge for researchers to develop disease-modifying OA treatments is, therefore, of paramount importance. Adult mesenchymal stem cells (MSCs), which have the ability to differentiate into cells of the chondrogenic lineage, have emerged as a candidate cell type with great potential for cell-based articular cartilage repair technologies. MSCs can be isolated from a variety of adult tissues, readily culture-expanded without losing their multilineage differentiation potential, and have been induced to undergo chondrogenic differentiation in vitro and in vivo.¹⁴
unlike chondrocytes, the use of MSCs is not hindered by the limited availability of healthy articular cartilage or an intrinsic tendency of the cells to lose their phenotype during expansion. The use of MSCs also obviates the need for a cartilage biopsy and, thereby, avoids morbidity caused by damage to the donor-site articular surface.

**Pathophysiology of OA:**
Much research into the pathophysiology of OA has focused on the loss of articular cartilage, caused by mechanical and oxidative stresses, aging or apoptotic chondrocytes. Articular chondrocytes within diseased cartilage synthesize and secrete proteolytic enzymes, such as matrix metalloproteinase and aggrecanases, which degrade the cartilaginous matrix. The proinflammatory cytokine interleukin 1 (IL-1) is the most powerful inducer of these enzymes and of other mediators of OA in articular chondrocytes. The induction of these factors leads to matrix depletion through a combination of accelerated breakdown and reduced synthesis. Other proinflammatory cytokines, such as tumor necrosis factor, are also involved in cartilage breakdown and, together with biomechanical factors implicated in OA pathophysiology, contribute to induction of the disease. Despite the considerable efforts put into development of inhibitors of these molecules for use in treating OA, clinical success with respect to the prevention of further cartilage matrix breakdown or cartilage restoration in OA remains indefinable.

**The Application of Mesenchymal Stem Cells to OA Cartilage**
Osteoarthritis (OA) has a direct effect on the functioning of several joints, of which the knee is the most important clinically. It has been estimated that all individuals above the age of 65 will have some clinical or radiographic evidence of OA. The basic pathophysiological feature of OA is a loss of articular cartilage, although multiple components of the joint, including bone and synovial membrane, may also be affected. The chondrocyte, which is the principal cellular component of the cartilage, is a relatively inert cell and has little regenerative capacity. While some regeneration does take place in childhood, this ability is lost with age and is almost completely absent after 60 years or more. In addition, complex molecular mechanisms, including the secretion of proteolytic enzymes, further degrade the diseased cartilage. These enzymes include aggrecanases and metalloproteinasases and are mediated by interleukin 1 as well as by tumor necrosis factor-alpha.

Some researchers have suggested that tissue damage in progressive, degenerative, joint diseases might be related to the depletion or functional alteration of MSC populations. Of importance, when considering the potential application of MSCs in OA treatment, researchers should ascertain whether MSCs obtained from the
patient with OA differ functionally from those of healthy individuals, in terms of their chondrogenic capacity and longevity. The proliferative, chondrogenic and adipogenic capacities of MSCs obtained from patients with OA are reportedly reduced.\(^\text{25}\) Perhaps the altered activity status of these MSCs is related to their exposure to elevated levels of proinflammatory cytokines and/or anti-inflammatory drugs. Whether susceptibility to OA might result from reduced mobilization or proliferation of MSCs remains to be ascertained.\(^\text{24}\) Several studies have described an age-dependent reduction in the number of progenitor cells isolated from human bone marrow,\(^\text{26,27}\) although others could not find any such inverse relationship between age and MSC numbers.\(^\text{25, 27}\) Also, an age-dependent decline in the differentiation capability of MSCs has been reported by several investigators.\(^\text{25-29}\) In this context, however, researchers and clinicians should note that sufficient numbers of MSCs with adequate chondrogenic differentiation potential can be isolated from patients with OA, irrespective of their age or the etiology of their disease.\(^\text{30, 31, 32}\) These results, therefore, suggest that the therapeutic use of MSCs for the regeneration of cartilage in patients with OA is feasible.

**Delivery Modes for Mesenchymal Stem Cells**

A crucial requirement for MSC-based OA therapy is the delivery of the cells to the defect site. Direct intra-articular injection might be possible in early stages of the disease when the defect is restricted to the cartilage layer, whereas a scaffold or matrix of some kind would be required to support the MCSs in cases where the subchondral bone is exposed over large areas.

**Direct Intra-articular Injection of MSCs**

Direct intra-articular injection of MSCs is, technically, the simplest approach to their use in OA therapy. Following injection, MSCs would be distributed throughout the joint space, and would interact with any available receptive cells and surfaces. The highly cellular synovial lines all the internal surfaces of the joint space, except for the cartilage and meniscus, so it is likely to be a primary tissue for MSC interaction.\(^\text{33}\)

Direct intra-articular injection of MSCs has only been carried out in a few numbers of studies. In one study, autologous MSCs in a dilute solution of sodium hyaluronan (hyaluronic acid) were directly injected into the knee joints of goats, in which OA had been induced by a total medial meniscectomy and resection of the anterior cruciate ligament.\(^\text{33}\) Joints exposed to MSCs showed evidence of marked regeneration of the medial meniscus, and implanted cells were detected in the newly formed tissue. Articular cartilage degeneration, osteophytic remodeling, and subchondral sclerosis were also reduced in the treated joints. There was no evidence of repair of the ligament in any of the joints.\(^\text{31}\) Whether the changes observed in MSC-treated joints resulted from direct tissue repair by the transplanted cells or from their interaction with host synovial fibroblasts at the site of injury is still unclear.

**Delivery by Cell Suspension**

Following delivery of cell suspensions, the aim is for transduced MSCs to release therapeutic proteins that interact with all available tissues, including cartilage. Considerable progress has been made towards defining the parameters that prolong intra-articular transgene expression, an approach that was originally developed for the treatment of rheumatoid arthritis (RA).\(^\text{34}\) Furthermore, insulin-like growth factor I 'administered' by intra-articular delivery partially reversed matrix degradation in OA.\(^\text{35, 36, 37}\) Other cell types were initially investigated, but MSCs have
the potential to be at least as beneficial when used in *vivo* approaches.\textsuperscript{[13, 15, 38]}

A growing body of literature indicates that many of the pleiotropic gene products considered necessary for cartilage repair and regeneration are compatible with intra-articular delivery in suspension. However, delivery of transforming growth factor β1 or bone morphogenetic protein 2 to the synovial resulted in severe swelling, fibrosis, and osteophyte formation within joints.\textsuperscript{[40, 41]}. Candidate complementary DNAs for synovial gene transfer should, therefore, be carefully chosen, safety-tested and validated.

**Delivery within a Matrix**

The above-mentioned anti-inflammatory treatments for RA and OA are, in principle, useful for preventing disease progression, but might not be able to restore damaged cartilage. An alternative strategy uses genetically modified MSCs in matrix-guided approaches to cartilage regeneration.\textsuperscript{[38,41]} MSCs are first stimulated to undergo chondrogenic differentiation, stabilized as chondrocytes, then introduced on a matrix to the defect site, with the aim of establishing a cartilage phenotype without progression to hypertrophy or differentiation.\textsuperscript{[13]} As already mentioned, however, this approach has been used mainly to treat focal cartilage defects. Future studies will show whether such technology will be suitable for repairing large areas of eroded cartilage, as occurs in advanced OA.\textsuperscript{[42]}

**Conclusions**

Direct intra-articular injection of cells is considered a technically simple approach to treatment of advanced OA, whether this approach can elicit beneficial effects (such as minimizing further cartilage damage) in human OA joints remains to be seen -- and, if so, to what extent and under which conditions. The use of MSCs in combination with bioactive substrates, natural or synthetic, also has significant clinical potential and is likely to be important in future, MSC-based, cartilage-repair technologies. In this context, MSCs might also offer promise in the future as vehicles for therapeutic gene delivery. In the long term, MSC-based technologies might be able to permit the engineering of cartilage not only for repair of focal lesions but also as a treatment option for OA joints, to realize the ultimate goal of a fully biological prosthesis.

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Pattern of Symptomatic Idiopathic Osteoarthritis In Elderly: A Hospital Based Study.

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Objectives: to assess pattern of symptomatic idiopathic OA in the elderly and the possible risk factors in that group of patients. \textbf{Subjects and methods:} A cross sectional study was conducted among 100 patients aged $\geq 60$ years from Ain Shams University hospital, each patient was subjected to comprehensive geriatric assessment. Hip, hand, and knee OA were diagnosed by American College of Rheumatology criteria, and 1\textsuperscript{st} metatarso-phalangeal, talonavicular, wrist joints, lumbar apophyseal joints and cervical apophyseal joints were diagnosed by presence of any of clinical manifestations plus Kellgren and Lawrence grading ($\geq$ grade 2). Risk factors were reported by history, examination and occupational exposure questionnaire. \textbf{Results:} Knee, hip and hand OA were present in 80%, 23% and 30% consecutively. 38% were obese and 12% were smoker. Seventy one percent were at risk of carrying heavy objects. Females have significantly more knee, hand, wrist, cervical and foot OA than males. Females were more obese and less smoker ($P=0.002$ and $<0.001$ consecutively). \textbf{Conclusion:} Females have overall and individualized sites (including: knee, hand, wrist, cervical and foot) OA more than males, and higher risk factors than males (including BMI and repeating the same movement in many sites).

\textbf{Key words:} Osteoarthritis, elderly, distribution, gender, risk factors

\textbf{Introduction}

Osteoarthritis (OA) is the most common form of arthritis (1)(2). Almost every age group is affected by OA, but prevalence increases dramatically after age 50 years in men and 40 years in women (3).

OA is a debilitating condition characterized by pain, joint inflammation and joint stiffness, and results in a substantial degree of physical disability (4). OA was ranked equally with heart disease, congestive heart failure and chronic obstructive pulmonary disease as a cause of physical disability (4).

Symptomatic OA should be a focus of studies because it causes disability and has formidable societal and public health impact; few studies have been conducted to study symptomatic OA among the elderly (5).

OA is multifactorial in aetiology. The specific aetiological factors are unknown (6). Over the last two decades many epidemiological studies have investigated the determinants of OA. These studies are important to improve understanding the mechanisms leading to OA and to determine whether (modifiable) risk factors exist for which preventive interventions can be developed and investigated (7).

There is controversy about risk factors of primary OA; Shephard reported that the risk factors of primary OA: age; the prevalence greatly increases with age, gender; women suffer more often than men; obesity; association is present with knee, hand, and
hip, mechanical factors; in form of occupational OA, and sports related OA, and genetic factors (8).

Although OA occurs worldwide, both its pattern and prevalence vary among populations (9).

**Aim of the work** was to report pattern of symptomatic idiopathic OA in the elderly and the possible risk factor in that group of patients.

**Methods**

A cross sectional design was used in this study. The study was conducted among 100 patients from Ain Shams University hospital. The study subjects were elderly patients with symptomatic primary OA. Each subject was subjected to comprehensive geriatric assessment with special consideration to reporting of risk factors (age, gender, BMI and smoking) and reporting of occupational risk factor that was based upon reporting the occupation that they held the longest during their lifetime whether or not they were occupationally active at the time of the survey, as the definition used in the National Survey on Health Impairment and Disability of 1998 in France (10).

Occupational exposure to biomechanical stresses was reported to the treating physician by yes or no, on items involved in a structured questionnaire: "During your entire professional life, did you (the patient) have to regularly 1) lift or carry heavy objects, 2) keep your affected joint in uncomfortable positions, as squatting or 3) repeat the same movements continuously (II)."

Diagnosis of symptomatic idiopathic OA for knee, hip and hand joints was according to American college of Rheumatology criteria for classification and diagnosis of knee, hip and hand idiopathic OA (12)(13)(14).

While diagnosis of symptomatic OA of other joints corresponds to definition of symptomatic OA used by Oliveria et al. (15) which based on both:

Symptoms applied in the Framingham OA study (16), these symptoms derived from Health and Nutrition Examination Survey (17). (pain, stiffness, aching, swelling and/or tenderness).

Plus radiographic based definition of definite OA (≥ grade 2) by traditional Kellgren and Lawrence (KL) grading (18).

Kellgren and Lawrence studied hip, knee, hand, foot, wrist, cervical, and lumbar spine. However in the last two they involved only apophyseal joints, while patella femoral joint was not involved (18).

<table>
<thead>
<tr>
<th>Joint involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee</td>
</tr>
<tr>
<td>Hip</td>
</tr>
<tr>
<td>Hand</td>
</tr>
<tr>
<td>Cervical</td>
</tr>
<tr>
<td>Lumbar</td>
</tr>
<tr>
<td>Wrist</td>
</tr>
<tr>
<td>Foot</td>
</tr>
</tbody>
</table>

**Exclusion criteria:**
Patients with secondary OA were excluded. In addition, we excluded patients with cognitive impairment, because the possibility of unreliable history, and Patients who refused to be included in our study.

The study protocol was approved by Geriatrics and Gerontology department scientific committee and informed consent was taken from each patient.

Statistical analysis:

Data were collected, revised, coded, tabulated and introduced into a personal computer for statistical analysis. Qualitative data were presented in the form of frequency tables (number and percent). Quantitative data were presented in the form of mean+/-SD.

Regarding qualitative data, the chi-square test or Fisher's Exact test was used to compare between the two groups.

Results

Current study included 100 patients aged ≥ 60 years, 50 males and 50 females. Knee, hip and hand OA were present in 80%, 23% and 30% consecutively (table 1). 38% were obese and 12% were smoker. 71% were at risk of carrying heavy objects (table 2).

Females have significantly more knee, hand, wrist, cervical and foot OA than males (P= 0.003, 0.029, <0.001, 0.003 and <0.001 consecutively). Females were more obese and less smoker (P= 0.002 and <0.001 consecutively) (table 3).

In males, exposure to carrying of heavy objects is significantly associated with knee OA, hand and lumbar OA (P= <0.001, 0.021 and 0.014 consecutively). However, in females, exposure to carrying of heavy objects is significantly associated with knee and lumbar OA (P= 0.002 and <0.001 consecutively).

There is significant association between higher experience of uncomfortable positions in males and knee, hip, hand, lumbar and cervical OA (P= <0.001, 0.009, <0.001, 0.033 and <0.001 consecutively). In females, there is significant association between higher experience of uncomfortable positions and knee, hand, wrist, cervical and lumbar OA (P= 0.029, 0.001, 0.001, <0.001 and <0.001 consecutively).

There is significant association between higher experience of repeated movements in males and knee, hand, lumbar and cervical OA (P= 0.001, 0.006, 0.025 and 0.001 consecutively).

Table (2): Risk factors in the study group:

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Gender</th>
<th>Age group</th>
<th>BMI group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>male</td>
<td>60-69 years</td>
<td>normal 18-25</td>
</tr>
<tr>
<td></td>
<td>female</td>
<td>≥70 years</td>
<td></td>
</tr>
<tr>
<td></td>
<td>50 (50%)</td>
<td>62 (62%)</td>
<td>48 (48%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38 38%</td>
<td></td>
</tr>
</tbody>
</table>
In females, there is significant association between higher experience of repeated movements and knee, hand, wrist, cervical, and lumbar OA (P <0.001 for all).

**Discussion**

OA is the most common joint disease in human, especially in the aging populations, and is expected to be the fourth leading cause of disability by the year 2020 (19)(20).

The heterogeneity of OA is gaining wider acceptance, and identification of distinct subgroups might provide further information (9).

This study aimed at estimating the pattern of distribution of primary OA in elderly Egyptian, in a hospital based study, with determination of presence of risk factors. 50 elderly men, and 50 elderly women were studied.

By studying pattern of OA distribution, knee OA was the most common followed by hip,
hand, cervical, lumbar, wrist and foot OA.

Our data about knee OA do not agree with O’Reilly et al who reported that the prevalence of symptomatic radiographic knee OA in older adults in Nottingham, England was 19% as overall prevalence in both men and women (21).

A study in West African teaching hospital, not in accordance with our data, patients' mean age was 53.7 and were diagnosed both by symptoms and radiology, revealed that 1% of patients have wrist OA (9).

Although Adebajo's study was a hospital based study, as the current study, the results may be affected by that male to female ratio was 3.5 : 1, resulting in less distribution of joints, as wrist joint, mainly affected in females.

Studying the prevalence of hand OA among white elderly ≥ 60 years in Framingham, 38.3% have symptomatic OA (diagnosed by symptoms and radiology) (22), which is in accordance with current data.

Studies' results in Europe were in accordance with our data regarding hip OA, have estimated that approximately 7–25% of Caucasian individuals over the age of 55 years suffer from hip OA; these estimates vary due to differences in the definition of OA or the selection of the study population (23;24;25;26).

The prevalence of facet joint pain, diagnosed by positive response to double local anesthetics, was 28%, and 66% in lumbar joints in elderly aged 61 – 70 years and greater than 70 years of age respectively; while in cervical joints, it was 35%, and 33% in elderly for the same age groups respectively, Mode of onset of pain was gradual onset (without incident) (27).

The higher distribution of knee, cervical and lumbar OA in our sample could be attributed to that our sample is hospital based and the pattern was described among cases in this cross sectional study.

On gender basis; females had significantly higher knee, hand, wrist, foot and cervical OA than males.

<table>
<thead>
<tr>
<th>Joint involved</th>
<th>Male</th>
<th>Female</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee</td>
<td>34 (68%)</td>
<td>46 (92%)</td>
<td>0.003</td>
</tr>
<tr>
<td>Hip</td>
<td>9 (18%)</td>
<td>14 (28%)</td>
<td>0.235</td>
</tr>
<tr>
<td>Hand</td>
<td>10 (20%)</td>
<td>20 (40%)</td>
<td>0.029</td>
</tr>
<tr>
<td>Cervical</td>
<td>17 (34%)</td>
<td>32 (64%)</td>
<td>0.003</td>
</tr>
<tr>
<td>Lumbar</td>
<td>44 (88%)</td>
<td>40 (80%)</td>
<td>0.275</td>
</tr>
<tr>
<td>Wrist</td>
<td>2 (4%)</td>
<td>20 (40%)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Foot</td>
<td>0 (0%)</td>
<td>23 (46%)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Male</th>
<th>Female</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>60-69 years</td>
<td>33 (66%)</td>
<td>29 (58%)</td>
</tr>
<tr>
<td>Group ≥ 70 years</td>
<td>17 (34%)</td>
<td>21 (42%)</td>
<td></td>
</tr>
<tr>
<td>BMI normal</td>
<td>32 (64%)</td>
<td>16 (32%)</td>
<td>0.002</td>
</tr>
<tr>
<td>Group Over-Weight</td>
<td>7 (14%)</td>
<td>7 (14%)</td>
<td></td>
</tr>
<tr>
<td>obese</td>
<td>11 (22%)</td>
<td>27 (54%)</td>
<td></td>
</tr>
</tbody>
</table>
The prevalence of radiographic and symptomatic knee OA was 42.8% and 15.4% respectively among the women aged 60 years and over in Beijing, higher than those in Caucasian women of the same age. The prevalence of radiographic and symptomatic knee OA were 27.6% and 7.1% respectively among the men aged 60 and over in Beijing, similar to those in the Caucasian men of the same age (28).

Among 1041 subjects aged 71–100 years (36% men), the prevalence of symptomatic hand OA, by symptoms and radiology, was higher in women (26.2%) than in men (13.4%) (29). which is in accordance with our data.

Manchikanti et al, reported that facet cervical joint pain was 39%, and 61% in males and females respectively in the age group between 61- 70 years (27), these agree with our results.

After age 50 years, women are more often affected with hand, foot and knee OA than men (30)(31).

Zoetermeer survey study demonstrated that the prevalence of 1st MTP joint in males is ranging between 10.1 % to 44.4%, while in females is ranging between 18.8% up to 61%(according to severity of radiology, and 5 year intervals of age groups above 60 years) (30), their higher percentage could be attributed to the diagnosis only by radiology.

In addition, most of our patients are recruited from outpatient clinics of geriatric and physical medicine, this explains the higher percentages of both knee and hip OA, because patients with hip and/ or knee OA could seek medical advice more than others. As both hip OA, along with OA of the knee, affect the ability to walk and climb stairs more than any other disease (32)(33).

Moreover, the prevalence of moderate-to-severe hip OA is significantly higher among Caucasians (34).

Furthermore, this explains the lower percentage of hand OA in comparing with knee OA, as supported by Oliveria et al, who mentioned that care seeking for symptomatic hand OA was substantially less frequent than for symptomatic knee OA in the Fallon Health Maintenance Organization (15).
By studying risk factors:

Lau et al studied knee and hip OA in hospitalized patients, excluding secondary OA, taking into considerations factors associated with OA; kneeling and squatting at work and high BMI. Among cases only, Lau et al reported lifting heavy objects in up to 84% and both squatting and kneeling percentage of 75% among those with either knee or hip OA (35), which is near to our results.

In the current study, 62% of patients had age between (60-69 years) and 38% of patients had age ≥70 years. In addition, 48% of patients had normal BMI (BMI=18-25), 14% of patients were overweight (BMI=26-29), while 38% of patients were obese (BMI=30-39); there was equal sex frequency and smoking was present in 70%, ex-smoking was evident in 28%, and in nonsmokers was evident in 12%.

Regarding mechanical loading risk factors, in Rossignol et al. study, agricultural workers reported exposure of both genders to lifting and uncomfortable positions (36).

Therefore reporting individual risks in each occupation could delineate the actual risks than the overall occupation.

By comparing risk factors in both genders:

There was no statistically significant age difference in both genders, while there was statistically significant high BMI in females versus males. There was statistically significant higher smoking evidence in males than females.

Studying occupational risk factors in both genders, revealed that in females there was statistically highly significant higher experience of uncomfortable positions of lumbar spine; and same movement repetition of lower limb joints and cervical joints.

In males, exposure to carrying of heavy objects, higher experience of uncomfortable positions and higher experience of repeated movements are significantly associated with knee OA, hand and lumbar OA in all, and hip in uncomfortable position and cervical OA with repeated movement risk.

On the other hand, in females, there is significant association between higher experience of repeated movements and knee, hand, wrist, cervical, and lumbar OA.

Farmers have high rates of hip OA (37). When specific job tasks were examined, jobs requiring kneeling or squatting along with heavy lifting were associated especially with high rates of both knee and hip OA. Forces across the knee increase in the crouching or squatting position; lifting loads from such a position further increases loading. Data from the Framingham Study suggest that such job activities cause anywhere from 15% to 30% of knee OA in men (19). Other occupational activities, including climbing stairs, walking on uneven ground, standing, and sitting, have been inconsistently linked to OA risk (37).

Occupation had been found to be associated with spinal OA in some groups (38)(39).

Similarly, Rossignol et al., studied Primary OA of hip, knee, and hand in relation to occupational exposure, and reported that repetition of movements was associated with hand OA (36).

Lifting heavy weights is linked to knee OA by Lau et al study who studied occupational risk factor (35) that is similar to the current data.
Occupational-exposure patterns contributed to the definition of groups at risk and will guide future research.

Conclusion

Females have overall and individualized sites (including: knee, hand, wrist, cervical and foot) OA more than males, and higher risk factors than males (including BMI and repeating the same movement in many sites).

References


Comparison of tools for nutritional assessment in elderly patients: 
A pilot study

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Background: Malnutrition is a major health related concern associated with higher morbidity and mortality in the elderly compared to their younger counterparts. Malnutrition is not an inevitable side effect of ageing, but many changes related to ageing can cause malnutrition. The early recognition of patients at high risk of malnutrition is needed to timely manage the condition and avoid its adverse outcomes. Several types of nutrition screening tools have been developed for evaluating the nutritional status of elders; however, the Mini-Nutritional Assessment-Short Form (MNA-SF) is the most widely used tool.

Aim: The aim of this study is to identify the most appropriate nutritional screening tool for use in hospitalized elderly population.

Method: Mini-Nutritional Assessment-Short Form (MNA-SF), Malnutrition Universal Screening Tool (MUST), The Nutritional risk screening (NRS), Patient-Generated Subjective Global Assessment (PG-SGA) and Geriatric nutritional risk index (GNRI) were administered to 20 patients. All patients were 60 years and over.

Results: Using the MNA-SF 12 (60%) of the studied sample were malnourished and 8 (40%) had normal nutritional status. Tools performance in predicting malnutrition was calculated. The sensitivity was 91%, 83%, 83% and 66% and specificity was 50%, 62%, 12% and 75% with the NRS, MUST, PG-SGA and GNRI, respectively. Combining different pairs of tools MUST and NRS together had better sensitivity 92.8% and specificity 66.6% then 2nd better two tools together is NRS and GNRI with sensitivity 91.6% and specificity 50% with accuracy 75% other tools showed high sensitivity but low specificity as PGSGA with NRS and PGSGA and GNRI.

Conclusion: NRS had the highest sensitivity while GNRI had the highest specificity among different studied assessment tools. MUST and NRS together had better sensitivity but lower specificity than either tool alone. Combining the NRS and GNRI had better sensitivity than GNRI alone and better specificity than NRS alone. We recommend using NRS alone as the optimal screening tool.

Keywords: Malnutrition, elderly nutritional status, nutritional assessment tools

Introduction:

Malnutrition is a deficiency, excess or imbalance of energy, protein and other nutrients enough to cause adverse effects on body form, function and clinical outcome. (1)
Screening for this state is justified in the elderly, as it is a frequent cause of morbidity in this population; it is associated with poor outcomes; simple, reliable, valid and acceptable screening tests are available to detect those who are malnourished or at risk of malnutrition; and there is benefit from nutritional intervention in those identified by screening.

Nutritional screening, in its various forms, looks for characteristics associated with nutritional problems so that the individuals identified can undergo full nutrition assessment and possible intervention. The tools used need to be quick and simple, acceptable to patients and healthcare workers. Furthermore, it must have good sensitivity for detecting treatable malnutrition; even if the specificity is lower.

The most widely used and extensively validated screening tool used by dieticians is the Mini-Nutritional Assessment (MNA). It is also a very useful tool for physicians involved in comprehensive geriatric assessment. One advantage of the MNA is that it is applicable to a wide range of elderly patients. It is simple and brief. A short-form version of the MNA has been developed (MNA-SF), and is strongly correlated with total MNA score and is applicable for both community dwelling and hospitalized elderly.

The wide spectrum of tools available for nutritional assessment is growing larger. They include GNRI, NRS, MUST, and PG-SGA. The current study was designed to identify the most appropriate nutritional screening tool for use in hospitalized elderly population.

**Methods:**

**Study design:**
A cross sectional study was conducted to compare the accuracy of different widely used nutritional screening tools in a sample of 20 consecutively hospitalized elderly patients. All patients were 60 years and over. The patients were categorized based on MNA SF results into 2 groups those with normal nutritional status (MNA SF score ≥11) and those with high risk of malnutrition (MNA SF score <11). The study was carried out in the Geriatrics and Gerontology Department at Ain Shams University Hospital in Cairo Egypt.

**Malnutrition screening tools**

**MNA SF:** The score is derived from six components: reduced food intake in the preceding three months; weight loss during the preceding three months; mobility; psychological stress or acute disease in the preceding three months; neuropsychological problems; body mass index.

**GNRI:** The GNRI formula results calculated as follow.

\[ GNRI = [1.489 \times \text{albumin (g/L)}] + [41.7 \times \frac{\text{weight}}{\text{WL0}}] \]

GNRI defines 4 grades of nutrition-related risk: major risk (GNRI<82), moderate risk (GNRI: 82 to <92), low risk (GNRI: 92 to≤98), and no risk (GNRI: ≤98).

**The Malnutrition Universal Screening Tool (MUST):** derives a score classifying malnutrition risk as low, medium or high on the basis of three components—BMI, history of unexplained weight loss and acute illness effect.

**The patient-generated-subjective global assessment (PG-SGA):** was adapted from the SGA. It includes additional questions regarding the presence of nutritional symptoms and short-term weight loss. It was designed so that the components of the medical history can be completed by the patient using a check box format. The physical examination is then performed by a health professional.
**Ethical considerations**

The study methodology was reviewed and approved by the Research Review Board of the Geriatrics and Gerontology Department, Faculty of medicine, Ain Shams University.

**Table 1: The scoring of the nutritional screening tools in the 2 groups**

<table>
<thead>
<tr>
<th>Patients with risk of malnutrition</th>
<th>Patients with normal nutritional status</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>age</td>
<td>64.7±5.8</td>
<td>61.8±3.7</td>
</tr>
<tr>
<td>MNA SF score</td>
<td>9±1.8</td>
<td>12.5±0.7</td>
</tr>
<tr>
<td>MUST score</td>
<td>1.9±1.2</td>
<td>0.6±0.9</td>
</tr>
<tr>
<td>PG SGA score</td>
<td>6.5±3.5</td>
<td>3.2±2.6</td>
</tr>
<tr>
<td>NRS score</td>
<td>3±1.8</td>
<td>1.5±1.7</td>
</tr>
<tr>
<td>GNRI score</td>
<td>85.3±8.7</td>
<td>94.3±3.9</td>
</tr>
</tbody>
</table>

**Statistical methods:**

The collected data were coded, tabulated, revised and statistical analyzed using SPSS program (version 16). Quantitative variables were presented in the form of means and standard deviation. Qualitative variables were presented in form of frequency tables (number and percent). The comparison between quantitative variables was done using t-test. Pearson’s correlation coefficient was used for parametric correlations. Receiver operating characteristic (ROC) curves were constructed. The area under each ROC curve was calculated to assess the discriminatory ability of the assessed tools to detect the risk of malnutrition.

**Table 2: the correlation of different nutritional screening tools scores and MNA SF scoring:**

<table>
<thead>
<tr>
<th></th>
<th>r</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST score</td>
<td>-0.72</td>
<td>0.000</td>
</tr>
<tr>
<td>PG SGA score</td>
<td>-0.63</td>
<td>0.003</td>
</tr>
<tr>
<td>NRS score</td>
<td>-0.555</td>
<td>0.011</td>
</tr>
<tr>
<td>GNRI score</td>
<td>0.79</td>
<td>0.000</td>
</tr>
</tbody>
</table>

**Results:**

The study included 20 participants 11(55%) females and 9(45%) males. All of the participants were ≥ 60 years old with mean age 63.6± 5.1 years (range 60-75 years).

The patients were categorized based on MNA SF results into 2 groups those with normal nutritional status 8 patients (40%) and those with high risk of malnutrition 12 patients (60%) of the studied sample.

The mean age of patients at risk of malnutrition was higher than those with normal nutritional status (64.7 years vs.61.8 years) yet of no statistical significance.

Table 1 show that there was significant difference between the two groups regarding each nutritional screening tools score.

The MUST, GNRI scores correlated better with MNA SF score than the NRS, PGSGA scores did (r= -0.72, 0.79) and (r= -0.555,-0.63) respectively (table 2).

Table 3 shows that NRS had the highest sensitivity while GNRI had the
highest specificity among different studied assessment tools.

Table 4 shows that using MUST and NRS together had better sensitivity 92.8% and specificity 66.6% with accuracy 85% , using NRS and GNRI together had sensitivity 91.6% and specificity 50% with accuracy 75% ,other tools showed high sensitivity but low specificity as PGSGA with NRS and PGSGA and GNRI

Table 5 and figure 1 show that GNRI had the highest area under curve (0.828) showing the highest specificity.

Table 3: the sensitivity, specificity and accuracy of each screening tool:

<table>
<thead>
<tr>
<th>tool</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST</td>
<td>83</td>
<td>62</td>
<td>75</td>
</tr>
<tr>
<td>PGSGA</td>
<td>83</td>
<td>12.5</td>
<td>55</td>
</tr>
<tr>
<td>NRS</td>
<td>91</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>GNRI</td>
<td>66</td>
<td>75</td>
<td>70</td>
</tr>
</tbody>
</table>

Discussion:

The goal of the current study was to compare the accuracy of different widely used nutritional screening tools in a sample of 20 consecutively hospitalized elderly patients.

Mini Nutritional Assessment is the tool recommended by European Society of Parenteral and Enteral Nutrition guidelines for screening and grading malnutrition (5).

MNA-SF and NRS categorize patients into two categories of nutritional status: not at risk of malnutrition and at risk of malnutrition. However, MUST and PG SGA categorize patients into three categories of nutritional status: not at risk of malnutrition, at moderate risk of malnutrition and at severe risk of malnutrition. GNRI categorizes patients into 4 groups: severe risk, moderate risk, low risk, and those with no risk. For comparison reasons, the three risk categories of MUST and the four risk categories of GNRI were combined into two risk categories like in Raslan’s study (11).

Those with normal nutritional status accounted for 40% of the studied sample while those with high risk of malnutrition accounted for 60% of the studied sample.

This agrees with multiple previous studies that proposed hospitalization as a major predictor of malnutrition in elderly population (12)(13)(14).

The MUST, NRS, GNRI, and PG-SGA scores not only were able to discriminate between the two categories, but they also correlated well with MNA SF score.NRS had the highest sensitivity 91% while specificity 50% with accuracy 75% then MUST sensitivity 83% and with specificity higher than NRS 62 % and accuracy 75% then PGSGA had same sensitivity as MUST but less specificity and accuracy.

This is in line with previous studies: Neelemaat et al., 2011 who reported that NRS was found to have higher sensitivity (62%) and specificity (93%) than MUST (sensitivity 61%, specificity 76%) and NRI (sensitivity 43%, specificity 89%), compared with SGA(15).Moreover, Raslan et al., 2009 reported that NRS was the best yield
for predicting unfavorable clinical outcomes (11).

**Table 4: the sensitivity, specificity and accuracy of the combined screening tools:**

<table>
<thead>
<tr>
<th>Combination</th>
<th>Sensitivity (SEN)</th>
<th>Specificity (SPEC)</th>
<th>Accuracy (ACC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUST + PG SGA</td>
<td>83.3</td>
<td>62.5</td>
<td>75</td>
</tr>
<tr>
<td>MUST + NRS</td>
<td>92.8</td>
<td>66.6</td>
<td>85</td>
</tr>
<tr>
<td>MUST + GNRI</td>
<td>83.3</td>
<td>62.5</td>
<td>75</td>
</tr>
<tr>
<td>PG SGA + NRS</td>
<td>100</td>
<td>12.5</td>
<td>65</td>
</tr>
<tr>
<td>PG SGA + GNRI</td>
<td>100</td>
<td>12.5</td>
<td>65</td>
</tr>
</tbody>
</table>

Most of the studies agreed that GNRI is a simple, easy and valid tool in assessing malnutrition in elderly and in hospitalized elderly. Advantages of the GNRI are the low level of participation required from patients and subsequent exclusion of bias associated with past unintentional weight loss investigations (7)(16).

In the current study, the sensitivity of GNRI was 66% and specificity 75% while Szeto, Kwan et al., 2010 (17) found the sensitivity and specificity of GNRI in predicting malnutrition to be 68.0% and 67.7% even when using another reference test (SGA).

The current study found PG-SGA to have sensitivity 83% and specificity 12.5% while in another study of Bauer et al., 2002 its sensitivity was 98% and the specificity was 82% (18). Low specificity in the current study may be due to small sample size, lack of confirmatory laboratory investigations as reference test.

Many studies compared combining nutritional screening tools to different anthropometric or laboratory markers of malnutrition (19)(20); but to our knowledge the current study is the only one assessed the effect of using different nutritional screening tools combinations on increasing their accuracy.
The sensitivity of using both NRS and GNRI together increased to be 92.8% with specificity of 66.6% and accuracy of 85%. So, using MUST and NRS together added little to the sensitivity of NRS alone. As a result NRS is considered the optimal screening tool for malnutrition in elderly hospitalized patients.

**Conclusion:**
NRS had the highest sensitivity while GNRI had the highest specificity among different studied assessment tools. MUST and NRS together had better sensitivity but lower specificity than either tool alone. We recommend using NRS for malnutrition screening in elderly hospitalized patients.

**Limitations of the study:**
A principal limitation of our study was that we compared all nutritional screening tools with the MNA SF, which is widely recommended, but is not regarded as the gold standard measure of malnutrition diagnosis.

**Funding:**
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**Disclosure:**
The author(s) declared no conflicts of interest with respect to the authorship and/or publication of this article.

**References:**
9. Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. Screening for Undernutrition in Geriatric Practice: Developing the Short-Form Mini Nutritional Assessment (MNA-


Development and Validation of a Nutritional Health Education Program for Health Care Providers in Geriatric Homes

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¹Community, Environmental and Occupational Medicine department, ²Geriatrics and Gerontology department, Faculty of medicine, Ain-Shams University, Egypt.

Objectives: To develop and implement a health education program for health care providers (HCPs) in geriatric homes about nutrition in elderly and to evaluate the program in terms of: HCP’s knowledge before and after the program, and to assess nutritional status of elderly served by HCP before and after the program and also to measure the frequency of different malnutrition risk factors in elderly at geriatric homes.

Subjects and methods: Randomized Clustered Controlled Clinical Trial was conducted on 240 elderly residing in 6 geriatric homes randomly selected. Three homes were assigned randomly to study group and three for control group. Elderly residing in the assessed geriatric homes aged between 60-75 years were included in the study. Health care providers (HCP) recruited was subdivided into 2 groups; study group and control group. HCP in the study group were subjected to a nutrition education program that was not administered to the control group.

Results: There was improvement in knowledge of HCPs after the intervention health education program regarding elderly nutrition compared to the baseline knowledge and also to control group (p<0.005). There was a statistical significant difference in the rate of weight loss which was declined over a period of 4 months from the beginning of the study on June 2012 till October 2012 in both groups (p <0.001), but the rate of weight loss had declined after the intervention at the end of the study in the study group compared to the control group. Most of the elderly were overweight BMI >30 (67.1%). Nearly half of the elderly (52.9%) were at risk of malnutrition with the MNA (Mini Nutritional Assessment) score (17.1-23.5). The majority of the elderly 98.8% were at risk of significant weight loss of at least 5% within 6 months by using the Appetite Assessment tool score with sum of score <=14. The majority of the elderly (98.3%) had a dental problem as(loss of teeth, eating difficulty, dry mouth or lesions) that may affect health and nutritional well-being with a score of >=2 by using Dental screening tool. There was improvement in physical aspect of quality of life in terms of activities and instrumental activities of daily living after implementation of the nutrition health education program in the study group compared to control group (p<0.001)

Conclusion: Geriatric homes need continuous monitoring and reinforcement of health education of the health care providers and this will be reflected on the nutritional status and well being of the elderly residing in these Geriatric homes. Raising the awareness of the elderly is needed to improve not only the nutritional state but also the physical and psychological aspects of quality of life to have better health outcomes and good healthy elders.

Keywords: Health Care Providers, Geriatric Homes, Nutritional Health education program.
Introduction

Nutrition is an important determinant of health in elderly patients. Over the past decade, the importance of nutritional status has been increasingly recognized in a variety of morbid conditions including cancer, heart disease, and dementia in persons over the age of 65\(^1\). Routine screening of patients to identify risk of malnutrition has been recommended by many national, international and specialist organizations\(^2\). Although there is no uniformly accepted definition of malnutrition in the elderly, some common indicators include involuntary weight loss, abnormal body mass index (BMI), specific vitamin deficiencies, and decreased dietary intake are used to detect malnutrition\(^3\).

Malnutrition in older patients is regularly under-diagnosed\(^4\) and many physicians have expressed their need for more education regarding nutritional status in older patients\(^5\). Health practitioners may not readily recognize weight loss in the elderly as a morbid symptom of malnutrition because some weight loss may be associated with age-related reductions in muscle mass\(^6\).

Many elderly patients have an increased risk for malnutrition compared with other adult populations. It is estimated that between 2\%-16\% of community-dwelling elderly are nutritionally deficient in protein and calories\(^7\).

If mineral and vitamin deficiencies are included in this estimate, malnutrition in persons over the age of 65 may be as high as 35\%\(^8\). The situation for hospitalized seniors is also disturbing. Studies of hospitalized older patients suggest that between 20\%-65\% of these patients suffer from nutritional deficiencies\(^9\).

The prevalence of malnutrition in long-term care facilities is estimated to be between 30\%-60\%\(^10\).

The purpose of nutrition screening is to identify malnourished individuals or those at risk of becoming malnourished, so that more extensive and comprehensive nutritional assessment can be performed and intervention and plan of care is implemented\(^11\). The Mini Nutritional assessment (MNA) was one of the tools that was developed to evaluate the risk of malnutrition in the elderly in general practice and upon admission to a nursing home or hospital\(^12\).

The sequale of malnutrition include physical, mental and social disability. If inadequate dietary intake continues for a long time (weeks or months) under nutrition results. If under nutrition is extreme, it results in diminished muscle mass, functional impairment and decreased Health related Quality Of life\(^13\). Therefore diet and exercise modulate the rate of functional decline with age and can be used to delay or postpone the onset of disability or dysfunction\(^14\).

Quality of life is a concept that includes physical and mental well being. In its broadest and most inclusive sense it is sometimes referred to as “life satisfaction”. The relationships between nutrition, aging and quality of life are recursive. Aging-associated factors alter certain aspects of nutrition, such as the sense of smell and taste, ability to chew and swallow, and gastrointestinal and bowel function, and these in turn may influence quality of life. At the same time, poor nutrition and lack of physical activity can lead to lack of appetite, inability to perform activities of daily living, changes in quality of life, morbidity and mortality\(^15\).
Methods:

A Randomized clustered Controlled Clinical Trial was conducted in a sample of geriatric nursing homes in Cairo governorate. The study was targeting geriatric homes of low to moderate social class that was identified by the fees administered by elders. All elder between the ages of 60 to 75 years old age were given the chance to be enrolled in the study including bed-ridden. Elder with difficulty for applying the assessment tools on them were excluded from the study. Three homes were randomly assigned to the study and 3 for the control group. Health care providers (HCPs) recruited from these homes were subdivided into 2 groups; study group and control group. HCPs in the study group were subjected to a nutrition education program that was not administered to the control group.

Study Setting and Period of the Study:
Six Geriatric Homes of low to moderate social class. The Study Was conducted on June 2012, the intervention started at the end of October 2012 and the study ended on August 2013

Sampling:

HCP Sampling: A change in nutrition knowledge was expected to range from 10% before the program to 50% after the program, this would yield a sample size of 30 HCPs in each of study and control groups at 0.05 alpha error and 0.80 power of the test.

Elderly Sampling: Assuming a change in UWL (Unintended Weight Loss) to range between 30% (before the program) to 10% (after the program) a sample size of 120 elder in each group is enough to detect such difference at 0.05 alpha error and 0.80 power of the test.

Nursing Home Sampling: Six (6) Nursing Homes were enough to fulfill the calculated sample size from HCP and elderly. They were randomly selected from a list of available geriatric homes in Cairo governorate. Permission for study conduction from nursing homes managers had limited the selection chance as some managers did not accept participation in the study. From the 6 nursing homes that agreed to participate in the study 3 were assigned randomly to study group and 3 for control group.

The Intervention “The Health Education Program”:

A bundle of interactive lectures and focus group discussion was provided along a period of 3 days to be repeated for 3 times during a total period of 1 year. Those sessions were reinforced by provision of brochures containing illustrated information about nutrition in elder and examples of diet for elder with different morbid conditions. The intervention started on October 2012, and the series of lectures were repeated on March 2013, and then repeated again and finally in August 2013.

Evaluation of the Health Education Program:

The Nutritional Knowledge of HCP was evaluated by administering the translated and revised form of Nutritional Awareness Questionnaire (Kimberly, 2010) before and after the program in the 2 groups. UWL (Unintended Weight Loss) was monitored every 2 months. A weight loss of more than 5% in 3 months or more than 10% in 6 months was considered as UWL. Quality of life (QoL Physical and Psychological aspects) were assessed before and after the program.
Data collection Tools:

Nutritional screening: **Mininutritional assessment (MNA)** checklist was used to identify different nutritional risk factors among elder. This tool classifies elder as "at risk" of malnutrition (score of 8-11 points), "malnourished" (score of 0-7 points) and "Normal nutritional status" (score of 12-14 points). An Appetite assessment tool was used to predict weight loss if the total score is less than 14. **Dental screening** tool with a score ≥ 2 indicates a dental problem that may affect eating function and consequently nutritional status.

**Anthropometric measurement assessment:** Weight of the served elderly was recorded at the beginning and the end of the study and at regular intervals (every 2 months) and unintended weight loss was reported. Other measurements include: weight, height, knee to ankle length, body mass index (BMI), mid arm circumference (MAC) and calf circumference.

**Nutritional Knowledge Questionnaire:** The knowledge of Health care providers regarding different aspects of elderly nutrition was assessed before and after the program by using the translated and revised form of Nutritional Awareness Questionnaire (16).

**Instrumental activities of daily living:** The total score may range from 0-8. A lower score indicates a higher level of dependence.

**Activities Of Daily Living:** The total score range from 0-6. The index of independence in ADL is based on the evaluation of the functional independence or dependence of patients.

**Geriatric Depression Scale:** A score 5 or more indicates positive screening for depression.

Ethical consideration: Research conduction approval was obtained from Ain –Shams University Ethical Committee and geriatric homes.

Statistical Analysis: The data was entered and analyzed using a statistical package for Social Sciences Program SPSS package version 20. Data were presented by descriptive statistics in form of frequencies & percentages for qualitative variables. Paired T test was used for analysis of Quantitative data & level of significance considered statistically significant (p- value <0.005).

Results:

Table (1): shows that there was a high statistical significant difference between both study & control groups regarding knowledge concerning Elderly nutrition after the nutritional health education program (p<0.001) , however the base line knowledge was nearly the same in both groups(p>0.005)

<table>
<thead>
<tr>
<th></th>
<th>Before Mean (SD)</th>
<th>After Mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study</strong></td>
<td>11.37(2.25)</td>
<td>18.53(2.62)</td>
<td>0.000</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>12.17(1.95)</td>
<td>11.53(1.59)</td>
<td>0.119</td>
</tr>
<tr>
<td><strong>P value</strong></td>
<td>0.147</td>
<td>0.000*</td>
<td>-</td>
</tr>
</tbody>
</table>

* Statistical Significant difference
Table (2.1) shows Age and Gender Distribution of Elder in both Study and Control Group, the majority of elderly aged 75 years or more with Mean value was 75.86(5.54). As regard the Gender, females represented more than half of the elderly (52.9).

### Table (2.1): Age and Gender Distribution of Elder in the Study and Control Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistic</th>
<th>Before Mean (SD)</th>
<th>After Mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o 60 –</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o 65 –</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o 70 –</td>
<td>107</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o 75 +</td>
<td>125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>75.86(5.54)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender: N (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Male</td>
<td>113(47.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>o Female</td>
<td>127(52.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tables (2.2): shows that there was a no significant decline in weight among the study group by the end of the study compared with control group which had statistically significant decline in mean weight which means improvement in nutritional status and effective educational program in comparison to the control group which had a higher rate (p<0.005)

### Table (2.2): Mean weight in Elder in the Study and Control Groups Before and after intervention at the End of the Study

<table>
<thead>
<tr>
<th></th>
<th>Before Mean (SD)</th>
<th>After Mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>74.65(4.99)</td>
<td>74.46(4.88)</td>
<td>0.198</td>
</tr>
<tr>
<td>Control</td>
<td>78.14(4.61)</td>
<td>77.62(4.65)</td>
<td>0.002*</td>
</tr>
<tr>
<td></td>
<td>0.000*</td>
<td>0.000*</td>
<td>-</td>
</tr>
</tbody>
</table>

* Statistical Significant difference

### Table (3): ADL and IADL Score among Elder in the Study and Control Group Before and After Intervention

<table>
<thead>
<tr>
<th></th>
<th>Before Mean (SD)</th>
<th>After Mean (SD)</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study</td>
<td>3.22(2.77)</td>
<td>4.47(1.14)</td>
<td>0.000*</td>
</tr>
<tr>
<td>Control</td>
<td>2.71(2.51)</td>
<td>2.60(1.74)</td>
<td>0.68</td>
</tr>
<tr>
<td></td>
<td>0.139</td>
<td>0.000*</td>
<td>-</td>
</tr>
<tr>
<td>Study</td>
<td>3.22(2.06)</td>
<td>4.62(1.31)</td>
<td>0.000*</td>
</tr>
<tr>
<td>Control</td>
<td>2.40(1.98)</td>
<td>1.99(1.30)</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>0.002*</td>
<td>*0.000</td>
<td>-</td>
</tr>
</tbody>
</table>

* Statistical Significant difference

### Discussion:

The present study showed that there was deficiency in the knowledge of health care providers regarding elderly nutrition as the mean of the base line knowledge in the study group was 11.37 (40.6 %) SD=2.25, while it was about 12.7(43.45%) SD=1.94 in the control group, but after intervention the mean knowledge of health care providers in study group had improved to reach 18.53(66.19%) SD=2.62, while it nearly remained the same 11.53(41.19%) SD=1.59 in control group who did not receive the nutritional educational problem.
In a study of Canadian community health nurses, a 50 item multiple choice questionnaire developed by the authors to assess the nutrition knowledge of community health nurses, the mean was 69% (SD = 8). Lindseth (1994) modified the 50 item —Nutrition for Nurses questionnaire used in the Canadian study to test nutrition knowledge of 176 Nurses working in 39 nursing homes, hospitals, and community/public health agencies. Mean score was 32.5% (SD = 6)

Figure (1) shows frequency distribution of different malnutrition risk factors in elderly

In the current study nearly half of the elderly residents suffered from weight loss which was 50.9% in the study group and 49.1% in the control group before the intervention Nutritional Health education program. These findings also correlate with (17) who estimated that 60% of nursing home residents lose weight while other studies found between 33% and 85% were malnourished (18). There was a no significant decline in mean weight among the study group by the end of the study compared with control group which had statistically significant decline in mean weight which means improvement in nutritional status and effective educational program in comparison to the control group which had a higher rate (p<0.005)

The functional ability of elderly residents in the form of activities of daily life and instrumental activities of daily living have been improved by the end of the study, this can be explained by improvement in nutritional status of the elderly in the study group.

Studies showed that increasing physical activity is a viable strategy for improving both health and quality of life of older adults (19). Stewart and King proposed two outcome categories (Functioning and well being) to measure the effect of physical activity on the overall quality of life. Functioning included physical activity, cognition and activities of daily living (19).
Conclusion:

Health care providers in both study and control groups nearly had the same level of baseline knowledge regarding elderly nutrition. There was a significant statistical difference between scores of baseline knowledge and scores after intervention among health care providers in the study group, compared to the control group.

There was no significant decline in mean weight among the study group by the end of the study compared with control group which had statistically significant decline in mean weight which means improvement in nutritional status and effective Health education nutritional.

There was also improvement in physical aspect of quality of life in terms of activities and instrumental activities of daily living after implementation of the nutrition health education program in the study group compared to control group.
References:
