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# The Impact of Work and Family Stress on Workers' Health

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***Authors' contributions***

*This work was carried out in collaboration between all authors. Author AZ designed the study, wrote the protocol. Authors FA and MS wrote the first draft of the manuscript. Author MS managed the literature searches. All authors participated in worker's questionnaire and clinical examination. All authors read and approved the final manuscript.*

***Original Research Article***

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## ABSTRACT

**Aims:** To evaluate the role of some work factors ( shift work and monthly income) and family factors (marital status and number of dependants) in the development and aggravation of some stress related diseases such as hypertension, coronary heart diseases (CHD), diabetes mellitus (DM), and peptic ulcer ( PU).
**Study Design:** A cross sectional study.
**Place and Duration of Study:** "El Nasr for Tobacco and Cigarettes" factory, Giza, Egypt. The study was performed between January to December 2012.
**Methodology:** The sample size included the whole work force (4800 workers)**.** A special questionnaire was designed including socio- demographic characteristics, medical and occupational histories. Clinical examination was performed in the medical department of the factory. Some investigations were done (ECG, urine for glucose, fasting and post-prandial blood sugar, Stress ECG and stomach endoscopy for suspected cases). Data obtained from the study were coded and entered using the statistical package SPSS version 12. Comparisons between groups were done using Chi Square ($X^2$) test.
**Results:** Hypertension was the most prevalent stress related disease among workers (19.2%), males were more affected than females (20.3% versus 15.02% respectively ), divorced were more affected than married and single ones (29.1% versus 6.8% and 1.7% respectively). There was exponential increased incidence of all diseases in workers with

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more dependents. There was more incidence of diseases among moderate income workers compared to lower and higher ones. Night shift workers were more afflicted when compared to rotating and morning shifts (25.7%, 22.5% and 16.8% respectively for hypertension).
**Conclusion:** Incidence of stress related diseases such as Hypertension, CHD, DM and PU was more prevalent among workers with stressful work factors such as night shift and low income, as well as those with stressful family situations such as increased number of dependants, being divorced or widowed.

*Keywords: Stress; hypertension; coronary heart diseases; diabetes mellitus; peptic ulcer.*

## 1. INTRODUCTION

In developing as well in developed countries, both work and home factors can predispose to illness such as hypertension, coronary heart diseases and diabetes mellitus. Adverse occupational and psychosocial factors have become increasingly important [1]. Research in many countries has produced ample evidence that a relationship exists between certain types of adverse working conditions and incidence of illness. Factors that seem to predispose groups of workers or individuals to particular disorders are called risk factors or stressors [2]. A person experiences stress when he or she does not have the ability or resources to cope when confronted with an external stimulus (stressor). Reactions to these stressors may play a role in initiating or promoting the precursor stages of diseases [3]. When such diseases affect the worker, they may be partially caused by adverse working conditions for example: excessive job demands, job insecurity, conflicts with teammates and supervisors [4].

It is important to remember that personal human characteristics as hereditary, social, cultural and environmental factors usually play a role as risk factors for these diseases [5].

Previous studies in Egypt used too small population to reach an accurate conclusion. Also no confirmation of medical illness was properly documented. In our study we propose to correct such deficiencies.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The study was carried in “El Nasr for Tobacco and Cigarettes”, one of the biggest factory for cigarettes production. It is located at Giza which is about 10 Km from Cairo, the capital of Egypt.

All work force (4800: 4008 males and 792 females) in “El Nasr for Tobacco and Cigarettes” factory was included in this study.

### 2.2 Study Design and Period

It is a cross sectional study during the period January 2012 to Dec 2012.

## 2.3 Questionnaire

The questionnaire was self designed. It is divided into 3 groups of questions:

Group 1: Socio- demographic characteristics of the workers included: family size and parity, housing conditions, level of education and marital status.
Group 2: Medical history to detect the presence of diseases as hypertension, coronary heart diseases, diabetes mellitus and peptic ulcer.
Group 3: Occupational history including questions about shift work and monthly salary.

### 2.3.1 Pretesting of questionnaire

Pretesting of the questionnaire was carried out in "El Nasr for Tobacco and Cigarettes" factory.

This was done in order to identify and correct errors in the questionnaire and also to ascertain the relevance, importance and adequacy of the questionnaires in collecting the required information from workers. The questions and the answers were in Arabic language. Examined workers were given an explanation about the purpose and objectives of the study before being asked for consent and to fill in the questionnaire. Two hundred questionnaires were administered randomly to workers. This helped to ensure that the questions were in line with the objectives of the study. The pre-testing was carried out by the researchers.

## 2.4 Clinical Examination

Clinical examination was performed in the medical department of the factory by the research team.

Clinical examination was done while the patient is lying in bed. Blood pressure was measured on the left arm twice and the average was taken. Persons were considered hypertensive if they meet one of the following conditions: Systolic blood pressure greater than or equal to 140 mm Hg, Diastolic blood pressure greater than or equal to 90 mm Hg [6].

## 2.5 Investigations

Urine analysis was done by using glucotest strips for screening to detect cases of Diabetes Mellitus. This was performed in the medical department of the factory. A blood samples were taken from positive cases to analyze fasting and post prandial blood sugar at kasr Alaini hospital laboratory, Cairo University.

ECG was done in the medical department of the factory. Stress ECG was performed for symptomatizing cardiac cases and stomach endoscopy was done for suspected cases of peptic ulcer at kasr Alaini hospital, Cairo University.

## 2.6 Data Collection

To administer the questionnaires, ten research assistants were employed. They were adequately trained and mobilized for the exercise. The research assistants were final year students from faculty of Medicine, Cairo University, Egypt.

## 2.7 Data Analysis

Data obtained from the study was coded and entered using the statistical package SPSS version 12. Comparisons between groups were done using Chi Square ($X^2$) test for qualitative variables. A "$p<0.01$" value was considered the limit below which the difference of the values would be statistically significant.

## 3. RESULTS AND DISCUSSION

### 3.1 Distribution of Stress Related Diseases among Examined Workers

The distribution of stress related diseases among examined workers revealed that hypertension showed the highest prevalence (19.2%), followed by diabetes mellitus (14.8%) Table 1.

**Table 1. Prevalence of stress related diseases among examined workers**

| Diseases | Numbers of workers | |
|---|---|---|
| | No | % |
| Hypertension | 922 | 19.2 |
| Coronary Heart diseases | 446 | 9.3 |
| Diabetes Mellitus | 710 | 14.8 |
| Peptic ulcer | 249 | 5.2 |
| **Total** | **4800** | **100** |

The epidemiological researches done in Egypt to study the prevalence of hypertension, and diabetes mellitus were minimal. Also no epidemiological researches were conducted to study the prevalence of CHD and peptic ulcer in Egypt. So, it was difficult to compare our results among specific work group to that of the general population.

However the data of an epidemiological study of hypertension in Egypt were collected during the Egyptian National Hypertension Project (ENHP) Survey in the years 1991-1994 [7] .This was a joint project between the Egyptian and US governments. They detected that the prevalence of hypertension among Egyptians was 26.3%. The prevalence of hypertension increased progressively with aging reaching a peak in the age group of 65-74. The prevalence of hypertension in the survey was higher than the prevalence of hypertension in our work because the sector studied in the survey included age group above 60 up to 74years old, which is not the case in our study as the retirement age in our country is 60 years old, so all studied group of workers were below 60.

The data from the Egypt Demographic and Health Survey (EDHS) 2008 showed that the crude prevalence of diagnosed diabetes among the adult population of Egypt aged 15-59 to be 4.07% [8]. The latter is much lower than the prevalence of DM detected in our study.

Our work was consistent with that of Ledingham [9] who reported that 15-20% of the population in developed countries was hypertensive. In a survey conducted on 5000 factory workers in 1981 in the Republic of Korea, revealed that the prevalence of hypertension ranges from 15-21% depending on age. [2]. The Canadian team at Laval University, Quebec, followed 6,719 workers over more than seven years and they detected that job strain, particularly in workers with low social support at work, may contribute to increased blood

pressure. High job demands, tight deadlines and low support in the workplace appeared to be triggers, particularly in men [10]. As part of the Belgian job stress project, the researchers studied the blood pressure of 89 middle-aged men and women found to have particularly stressful jobs. Another 89 men and women not experiencing job stress also volunteered for the study. They found that high-job-stress men and women had higher blood pressure [11]

In developing countries compared to developed countries the prevalence of diabetes mellitus (DM) in relation to age group starts to raise at an earlier age, with an overall higher total prevalence rates. Our work showed that about 14.8% of the working population were diabetic Table 1.This is in accordance with a cross sectional study performed by Zafar et al. [12] in Rawalpindi which is one of the cities in Northern Punjab of Pakistan in July 2008. They detected that 15.41% of the males and 12.31% of females were found to have diabetes mellitus. In a study done by Al Zurba and Al Mansour [13] among health care workers in ElBahrain, they detected that about 16.9% of the total sample had an abnormal glucose tolerance.

About 9.3% of workers in this study were complaining of CHD Table 1. This was nearly similar to the results of a study done by Delmiral et al. [14] who explore the association between job strain and CHD, they detected that the prevalence of CHD among the studied group was about 8%.

In a collaborative meta-analysis study done by Kivimaki and his colleagues [15] they detected that job stress was found to significantly associate with CHD events, as compared with no stress in the workplace. Being stressed on the job was associated with nearly a 25% increased risk of CHD and the association remained significant when adjusting for confounding factors.

Our work showed that about 5.2% of the workers were complaining of peptic ulcer. In a cohort study done by Anda et al. [16] on 4511 persons who had not previously been diagnosed with peptic ulcer disease, they found that the cumulative incidence of ulcers was 7.2% for persons who were stressed and 4.0% for persons who were not. A retrospective case-control study was conducted by Wachirawat et al. [17] to clarify the relation between psychological and other risk factors, notably helicobacter pylori (H. pylori) infection, in contributing to the occurrence of peptic ulcer (PU) disease. This study was done at Siriraj Hospital, Bangkok from March to December 2000. Seventy patients diagnosed by endoscopy as new PU or peptic perforation were compared with 70 blood donors control matched for age and sex. The results showed that PU was associated with chronic stress and family history. The authors concluded that stress and family history, not H. pylori infection, were important risk factors for PU in this population.

### 3.2 Study the Relation between Stress Related Diseases and the Workers' Age

Our study revealed a statistically significant difference on comparing different types of stress diseases and the age Table 2.

This concurs with the results reported by WHO (1985) that the prevalence of stress diseases in 5 to 10% among the working population, being higher among the older age group. They attributed that to the multiple psychological, physiological and behavioral disorders which occur in the old age.

**Table 2. Distribution of stress related diseases by age**

| Age/ Diseases | <30 | | 30-50 | | >50 | | Total | | $X^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | N0 | % | | |
| No of workers | 1113 | | 2265 | | 1422 | | 4800 | | | |
| Hypertension | 96 | 8.6 | 467 | 20.6 | 359 | 25.2 | 922 | 19.2 | 117 | <.001 |
| Coronary Heart diseases | 4 | 0.3 | 202 | 8.9 | 240 | 16.8 | 446 | 9.3 | 203 | <.001 |
| Diabetes Mellitus | 47 | 4.2 | 402 | 17.7 | 261 | 18.8 | 710 | 14.8 | 129 | <.001 |
| Peptic ulcer | 42 | 3.7 | 159 | 7.0 | 48 | 3.3 | 249 | 5.2 | 29.5 | <.001 |

## 3.3 The Relation between Stress Related Diseases and Workers' Gender

Also Table 3 showed that the prevalence of stress related diseases was higher among males than females.

**Table 3. Distribution of stress related diseases by gender**

| Gender/ Diseases | Male | | Female | | Total | | $X^2$ | P |
|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | N0 | % | | |
| No of workers | 4008 | | 792 | | 4800 | | | |
| Hypertension | 803 | 20.3 | 119 | 15.02 | 922 | 19.2 | 10.7 | <.001 |
| Coronary Heart diseases | 402 | 10.02 | 44 | 5.5 | 446 | 9.3 | 15.7 | <.001 |
| Diabetes Mellitus | 603 | 15.04 | 107 | 13.5 | 710 | 14.8 | 1.24 | .266 |
| Peptic ulcer | 226 | 5.6 | 23 | 2.9 | 249 | 5.2 | 10.1 | .002 |

The National Heart, Lung and Blood Institute in USA [18] estimated on the basis of a survey conducted in 1971-1974 that 19.5% of employed males had hypertension in comparison to 13.5% of employed females. Kang [19] studied the influence of sex and age on of the onset of symptoms of peptic ulcer among 492 patients. He found that 77% of patients were complaining of duodenal ulcer in the first 3 decades and 54% with late onset were male. Also Simon [20] reported that peptic ulcer disease affects all age groups, but is rare in children. Men have twice the risk of ulcers as women. The risk of duodenal ulcers tends to rise, beginning around age 25, and continues until age 75.

This is in accordance with the results obtained in our study that the prevalence of peptic ulcer was higher among male workers in the age group 30-50years Tables 2 and 3.

## 3.4 The Relationship between Marital Status and Stress Related Diseases

Our work showed that the prevalence of hypertension, CHD, diabetes mellitus and peptic ulcer was higher among the divorced and widow's employees when compared to the single and the married ones Table 4.

These findings are consistent with those reported by Somers [21] who stated that the prevalence of hypertension, CHD, peptic ulcer and diabetes was higher among divorced and separated individuals. Somers also reported that the morbidity and mortality rates were higher among the divorced than the married or single adults.

**Table 4. The relationship between marital status and stress related diseases**

| Marital status/ Diseases | Single | | Married | | Divorced and widows | | Total | | $X^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|
| | No | % | No | % | No | % | N0 | % | | |
| No of workers | 905 | | 2097 | | 1798 | | 4800 | | | |
| Hypertension | 44 | 4.8 | 355 | 16.9 | 523 | 29.1 | 922 | 19.2 | 240 | <.001 |
| Coronary Heart diseases | 16 | 1.7 | 143 | 6.8 | 287 | 15.9 | 446 | 9.3 | 171 | <.001 |
| Diabetes Mellitus | 24 | 2.6 | 302 | 14.4 | 384 | 21.3 | 710 | 14.8 | 168 | <.001 |
| Peptic ulcer | 17 | 1.8 | 99 | 4.7 | 133 | 7.3 | 249 | 5.2 | 38.9 | <.001 |

In a research work done by Brown and Heninger [22] on a group of working women, they found that divorced women were roughly 10 times more likely to have chronic medical problems ( hypertension, diabetes mellitus and peptic ulcer) than the married women ( 38% versus 4%). They concluded that marital status is an important factor in psychological well being: marital happiness contributes for more global happiness than any other variable, including satisfaction with work and friendship. Marital disruption is one of the major stressful life events.

Tennant [23] declared on his study on 1999 that there is strong and consistent evidence across all the reviews that social isolation and lack of quality social support are independent risk factors for CHD onset and prognosis: the risks are increased 2–3-fold and 3–5-fold, respectively.

A study published in the journal Physiology and Behavior by Robles and Kiecolt-Glaser [24] they noted that the simple act of being married can add years to a person's life. Marriage can even lower the risk of all sorts of diseases, including cancer, high blood pressure, heart disease, and the flu. Caring spouses often encourage each other to eat right, exercise, take vacations, and choose a healthy lifestyle. Close and supportive companionship also acts as a buffer against stress and all of its physical and emotional consequences.

Also the result of this study was in accordance with that obtained by Chida and Hamer [25] on studying the associations of adverse psychosocial factors with diabetes control in diabetic populations. They demonstrated on their meta-analysis that adverse psychosocial factors were significantly associated with poor diabetes control and more notably, sensitivity analyses showed that low social support was more robustly associated with poor diabetes control than stressful events.

## 3.5 The relation between Stress Related Diseases and the Number of Dependants

In the current study it is evident that the prevalence of stress related diseases was higher among workers who sponsors of more than 3 dependants and those with monthly income range from 500-1000 LE Tables 5 and 6.

### 3.6 The Relation between Stress Related Diseases and the Monthly Income

These findings agreed with the results obtained by Dorian and Taylor [3] who stated that individuals living under low socio-economic conditions, in overcrowded houses were more vulnerable to hypertension, CHD and diabetes mellitus. This vulnerability may be due to the fact that those persons with low economic standards have no facilities for physical activities, in the same time; they are usually heavy smokers and have bad eating habits.

**Table 5. Distribution of stress diseases by the number of dependants**

| No of dependants/ | <3 | | 3-5 | | >5 | | Total | | $X^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|
| Diseases | No | % | No | % | No | % | No | % | | |
| No of workers | 1147 | | 2736 | | 917 | | 4800 | | | |
| Hypertension | 95 | 8.3 | 473 | 17.3 | 354 | 18.6 | 922 | 19.2 | 317 | <.001 |
| Coronary Heart diseases | 5 | 0.4 | 287 | 10.5 | 154 | 16.7 | 446 | 9.3 | 173 | <.001 |
| Diabetes Mellitus | 82 | 7.1 | 446 | 16.3 | 182 | 19.8 | 710 | 14.8 | 76.7 | <.001 |
| Peptic ulcer | 29 | 2.5 | 164 | 5.9 | 56 | 6.1 | 249 | 5.2 | 21.7 | <.001 |

**Table 6. Distribution of stress related diseases by monthly income**

| Income/ | <500 | | 500-1000 | | >1000 | | Total | | $X^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|
| Diseases | No | % | No | % | No | % | No | % | | |
| No of workers | 1125 | | 2387 | | 1286 | | 4800 | | | |
| Hypertension | 87 | 7.7 | 562 | 23.5 | 273 | 21.2 | 922 | 12.7 | 128 | <.001 |
| Coronary Heart diseases | 6 | 0.5 | 296 | 12.3 | 144 | 11.1 | 446 | 4.6 | 135 | <.001 |
| Diabetes Mellitus | 53 | 4.7 | 454 | 19.0 | 203 | 15.7 | 710 | 7.4 | 125 | <.001 |
| Peptic ulcer | 27 | 2.4 | 163 | 6.8 | 59 | 4.5 | 249 | 2.7 | 31.7 | <.001 |

Harlan [26] suggested that many social factors such as education, monthly income and place of residence have an important role in the development of hypertension, CHD and peptic ulcer among working population.

Steptoe and his colleagues [27] studied the effect of low socio economic status and the risk of cardiovascular diseases. Participants were 123 men and 105 women in good health aged 47–58 years drawn from the Whitehall II cohort of British civil servants. They detected that lower socioeconomic status is associated with delayed recovery in cardiovascular function after mental stress. Impaired recovery may constitute a mechanism through which low socioeconomic status enhances cardiovascular disease risk.

Also Richman and his colleagues [28] reported that lower wage workers are more likely to work part time, at lower hourly rates, with few benefits, and, often, inflexible part-time schedules, all conditions of which create work-life challenges and stress for families and single-parents.

Chin and Miller [29] deduced that individuals of low socio economic status are liable to chronic disease, like insulin resistance, high blood pressure, and systemic inflammation. Psychological stress was assessed in 3 national surveys administered in 1983, 2006 and 2009 by Cohen and Janicki-Deverts [30]. They detected greater stress-related health risks

those of lower socioeconomic status, and men potentially subject to substantial losses of income and wealth.

## 3.7 Study the Effect of Work Shift and Some Stress Related Diseases

Our studied group showed that the prevalence of all stress related diseases was higher among night shift workers when compared to rotating and morning shift Table 7.

**Table 7. Distribution of stress related diseases by work shift**

| Work shift / | Morning | | Rotating | | Night | | Total | | $X^2$ | P |
|---|---|---|---|---|---|---|---|---|---|---|
| Diseases | No | % | No | % | No | % | No | % | | |
| No of workers | 3279 | | 638 | | 883 | | 4800 | | | |
| Hypertension | 551 | 16.8 | 144 | 22.5 | 227 | 25.7 | 922 | 19.2 | 40.9 | <.001 |
| Coronary Heart diseases | 252 | 7.6 | 76 | 11.9 | 118 | 13.3 | 446 | 9.3 | 32.6 | <.001 |
| Diabetes Mellitus | 367 | 11.2 | 135 | 21.1 | 208 | 23.5 | 710 | 14.8 | 108 | <.001 |
| Peptic ulcer | 128 | 3.9 | 47 | 7.3 | 74 | 8.3 | 249 | 5.2 | 35.5 | <.001 |

Similar findings were obtained by Koller et al. [31] who investigated 270 Australian workers in an oil refinery; they found that the prevalence of hypertension, CHD was higher among workers employed in the night and rotating shifts than those employed only in the day shifts. Alfredsson and co workers [32] in their assessment of the effect of work condition on workers' health during their interview survey on 4500 workers, they reported a significantly high incidence of hypertension among night and rotating shift workers than day workers.

Puttonen et al. [33] on their work which aims to review the current knowledge of the mechanisms between shift work and CHD, detected that shift work can increase the risk of CHD by several interrelated psychosocial, behavioral, and physiological mechanisms. The psychosocial mechanisms relate to difficulties in controlling working hours, decreased work-life balance and poor recovery following work. The most probable behavioral changes are weight gain and smoking. The plausible physiological and biological mechanisms are related to the activation of the autonomic nervous system, changed lipid and glucose metabolism, and related changes in the risk for atherosclerosis, metabolic syndrome, and type II diabetes.

Waage et al. [34] studied shift work disorder (SWD) among oil rig workers. A total of 103 shift workers (2 weeks on 7 nights/7days, 12-h shifts, 4 weeks off), working at an oil rig in the North Sea were included in the study. They detected that 23.3% individuals were suffering from SWD. These workers had poorer sleep quality and more subjective health complaints in the non-work period when compared with day shift workers.

Wang et al. [35] on their study about the effect of shift work and chronic diseases, they detected that there is a suggestive adverse relationship between shift work and the risks of CHD, metabolic syndrome and diabetes.

In 2008, Biggi et al. [36] published results suggesting that permanent night workers had statistically significant higher body mass index (BMI), serum total cholesterol levels, and triglyceride levels, as well as greater use of antihypertensive, hypoglycemic, and lipid-lowering medications, compared to day workers.

Our work was in accordance with the work reported by the large cohort study done by Sugisawa and Uehata [37] who detected that the risk of peptic ulcer disease in permanent night-shift workers was twice the risk in daytime.

Another study done by Pietroiusti et al. [38] comparing day and night workers for H. pylori positive results showed a statistically significant increased prevalence of duodenal ulcer in night workers as detected with upper gastrointestinal endoscopy.

ADAM [39] postulated that people who work the night shift had a significantly higher incidence of ulcers than day workers. Researchers suspected that frequent interruptions of sleep may weaken the immune system's ability to protect against harmful bacterial substances.

## 4. CONCLUSION

Stressful working conditions such as shift work and low income and stressful family situations such as increased number of dependants, being divorced or widowed had a marked influence on the prevalence of stress related diseases such as Hypertension, CHD, DM and PU.

Workplace stress can be reduced by: identify the problem, design and implement interventions and improve workers' skills at coping with stress.

Reducing workplace stress might decrease disease incidence .However; this strategy would have a much smaller effect than tackling standard risk factors such as smoking and physical inactivity. Incorporating physical activity into your working day will help, use the stairs instead of the lift, get off the bus one stop early, or park the car away from the office, so that you walk some of the way to work.

Interpersonal relations both within the family members or workers colleagues indicate care and concern which can have a protective effect when one is confronted with stressful situation. In general, social support functions as an important stress buffer. The more social support people have, the less stress will have an opportunity to affect them in a negative way.

## 5. LIMITATIONS

The study is limited as it was carried out among a group of workers who were always complaining especially when they are asked about their marital status or the monthly salary.

## CONSENT

All authors declare that a verbal consent was taken from workers and a written consent was obtained from "El Nasr for Tobacco and Cigarettes" factory for publication of this research work.

## ETHICAL APPROVAL

Prior permission was obtained from the authorities of faculty of Medicine, Cairo University, Egypt, before the study started. Recruitment into the study was voluntary and nobody was

forced into participation. Confidentiality was maintained by asking respondent not to write their names; just the questionnaire sheet took a number.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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