

ORIGINAL ARTICLE

Thyroid gland disturbances in pediatric shift work nurses employed in clinical hospital centre

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ABSTRACT

The aim of this paper is an attempt to explore the cause of thyroid gland disturbances in female pediatric nurses employed in a Pediatric Intensive Care Unit in an Eastern European hospital. A group of twenty hospital nurses was studied of whom fourteen suffered from some type of thyroid gland disturbances and a group of twenty primary care nurses with only sporadic incidence of thyroid disturbances. Regarding hypothyroidism they differ statistically significantly, $p = .0399$, as to obesity $p = .0017$, comparing thyroiditis $p = .0374$, and by goiter $p = .008$. Pediatric hospital nurses' occupation requires contact with sick newborns and small children for 12-hour shifts. Thyroid gland disturbances are not fully explained, they vary from genetically origins, autoimmune processes, environmental stressors. Daily high level stress exposure of the mentioned hospital nurses can contribute to developing thyroid disturbances. Trained medical staff under the pressures of caring for this population may become sick. In such departments more nurses should be employed if shift work is performed under elevated stress. Signs of this stress might include inadequate nourishment causing obesity and cigarette smoking especially in night shifts. It is the task of Occupational Medicine to determine if stress exposure causes thyroid disturbances, especially in 12 hour shift workers, resulting in interventions to enhance preventive measures.

Key Words: Pediatric hospital nurses, Shift work, Thyroid gland disturbances

1. INTRODUCTION

Occupational stress does not necessarily lead to absenteeism and unsatisfaction.^[1] Hospital management needs to be aimed to provide for all employees a working environment with maximum job satisfaction and opportunities for personal growth. This can be a challenge in the health care industry. The human body, when under threat, elicits a set of neuroendocrine responses.^[2] The psychological stress elevates metabolic demands. Energy mobilized is not used but is stored in visceral fat depots by the combined action of hypercortisolism and hyperinsulinemia. These metabolic disturbances can lead to the clinical expression of a number of

comorbidities including obesity, hypertension, dyslipidemia and endothelial dysfunction and cardiometabolic risk factors. Autoimmune thyroid diseases can be caused by stress.^[3] They are heterogeneous in their clinical presentation: the two main forms are autoimmune thyroiditis and Graves' disease. This first, autoimmune thyroiditis may be asymptomatic for a long time and defining its natural history in a single patient may be difficult. Graves' disease often occurs by orbitopathy and other visible symptoms that patient quickly register and react to it.

Thyroid gland hormones have a protective role on the whole organism. Animal experiments showed that thyroid hor-

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mones limit the disturbance of the microstructure of the liver caused by stress.^[4] In the same way experiments on rats showed that thyroid hormones applied to rats in high stressed situations reduce atrophy of alveolar bone, teeth mobility, strengthen enamel acid resistance.^[5] It is obvious that the normal status of the thyroid gland is indispensable for regular body functioning. It is especially important in young persons preventing growth deterioration and mental supporting.

Although positive correlation was shown between stress and dysthyroidism, the relation can only be hypothetical, indirect and partial.^[6] Stress, drugs and infections can cause thyroid disturbances, but there is no clear evidence of causality and the mechanisms by which environmental factors trigger thyroid autoimmunity in genetically predisposed individuals.^[7]

Gender also has an important role. The prevalence of hyperthyroidism in women is 10 times greater than in men.^[8] Age, iodine, selenium, cigarette smoking, viral and bacterial infections are cofactors for thyroid gland disturbances. Environmental pollution by metals and chemicals (organochlorines, pesticides) are the main factors in the present – day spread of the disease.^[9]

A man can have influence some of the factors, *e.g.* he can quit cigarette smoking, try to avoid infective diseases, and support healthy nourishment.^[10]

The aim of this research was to find out the answer to the question of the reasons for the elevated incidence of thyroid gland disturbances in pediatric hospital nurses in a Pediatric Intensive Care Unit. Fourteen out of twenty hospital nurses that are routinely examined at the Department of Occupational Medicine suffer from thyroid gland disturbances. They are all capable of working, but it must be noted that they work in 12 hour shifts during the day and night dealing with very complex newborns and small children patients. Some of the nurses are on the thyroid therapy and some on the Nuclear Medicine Unit examination.

Another goal is to raise the level of managements sensitivity towards the nurses who work in challenging conditions. Although the research can not prove direct causal relationship between such work and thyroid gland disorders it would be important to carefully monitor the above mentioned working population. The situation could be improved by recruitment of additional nurses in these positions.

2. MATERIAL AND METHODS

2.1 Examinees

The first group of examinees consisted of 20 female pediatric hospital nurses from a Pediatric Intensive Care Unit. Their mean age was 48 years (27-62 range). They were employed

for an average of 23 years (2-39 range). The second group of examinees consisted of 20 female primary care nurses. Their mean age was 43 years (26-59 range). They were employed mean 21.55 years (5-36 range).

2.2 Statistical methods

Statistics Stat Soft 10.0 was used. To match the two groups of examinees Kruskal-Waliss test was used and linear regression analyses – correlation matrices.

3. RESULTS

The results showed that in the first group of examinees a high incidence of thyroid gland disturbances occurred (70% of the total) (see Table 1). In the second group of examinees incidence of thyroid gland disturbance was sporadic (see Table 2). Regarding hypothyroidism, the two groups of examinees differ statistically significantly, $p = .0399$, on behalf of majority disturbances in hospital nurses. As to obesity, they differed statistically significantly too, $p = .0017$, leading by hospital nurses.

In terms of thyroiditis and goiter, they differ statistically significantly, $p = .0374$ for thyroiditis and $p = .087$ for goiter at hospital nurses.

Years of employment and hypothyroidism correlate positively, $r = .47$ (see Figure 1). Modest positive correlations were found and between years of employment and thyroiditis, $r = .096$ as well as for age and thyroiditis, $r = .049$.

4. DISCUSSION

The night shift work addresses three influences socio-cultural impacts, health-related impacts and night work, which offers the opportunity to gain more clinical experiences and to learn more.^[11]

Among shift workers insomnia and cognitive impairments could appear.^[12] Female shift workers complain significantly more about sleep disorders than male shift workers.^[13] Hospital management could find an optimum number of night shifts to prevent excessive fatigue in nurses and possible consequential errors on workplace.^[14] Repeated night shift work causes chronic fatigue, as well as social and domestic disruption. Hospital nurses spend days and nights in hospital areas, they are rarely at home which influences their children and marital status. There is always a risk at such burdened nurses to commit a mistake on workplace. The maximal attention is devoted to careful work to avoid operational errors. These nurses had on average 23 years of employment with great working experience. Besides a young nurse there is always an older nurse who is mostly a nurse with higher qualification.

Table 1. Nurses employed in clinical hospital centre Rijeka

No	Age	Yrs. Empl.	BMI	Struma	Thyroiditis	Hypothyroidism	Obesity	Hypertony
1	49	28	36	0	0	1	1	1
2	40	19	30	0	0	1	1	1
3	41	18	22	0	0	0	0	0
4	48	28	24	0	1	0	0	0
5	44	24	24	0	0	0	0	0
6	35	15	30	0	0	0	1	0
7	33	11	30	1	0	0	1	0
8	53	30	32	0	0	0	1	1
9	37	17	28	0	0	1	1	0
10	59	36	25	0	0	0	0	1
11	50	30	25	0	0	1	0	0
12	53	31	26	0	1	0	0	0
13	57	30	32	0	0	1	1	0
14	26	5	31	1	0	0	1	0
15	47	26	25	0	0	1	0	0
16	31	10	27	0	0	1	0	0
17	39	18	28	0	1	0	1	0
18	48	25	24	0	1	0	0	0
19	32	10	26	1	0	0	0	0
20	39	20	33	0	0	0	1	0

Note. Yrs. Empl.: years of employment; Struma: goiter; BMI: body mass index

Table 2. Nurses employed in health centre Rijeka

No	Age	Yrs. Empl.	BMI	Struma	Thyroiditis	Hypothyroidism	Obesity	Hypertony
1	60	39	25	0	0	0	0	1
2	51	31	22	0	0	0	0	1
3	34	4	25	0	0	0	0	0
4	59	33	30	1	0	0	1	1
5	55	34	25	0	0	0	0	0
6	47	12	23	0	0	0	0	0
7	27	2	21	0	0	0	0	0
8	36	7	21	0	0	0	0	0
9	53	31	25	0	0	1	0	0
10	47	27	23	0	0	0	0	0
11	58	35	23	0	0	0	0	0
12	62	35	25	0	0	0	0	1
13	51	28	25	0	0	0	0	1
14	49	29	27	0	0	0	0	0
15	36	15	19	0	0	0	0	0
16	38	11	21	0	0	0	0	0
17	50	24	27	0	0	0	0	0
18	57	35	25	0	0	0	0	0
19	51	28	25	0	0	0	0	0
20	41	13	20	0	0	0	0	1

Note. Yrs. Empl.: years of employment; Struma: goiter; BMI: body mass index

It is important Nursing Management finds a good balance between nurse demands and nurses abilities. For example, employing a few more nurses on the night shift would facilitate the work.

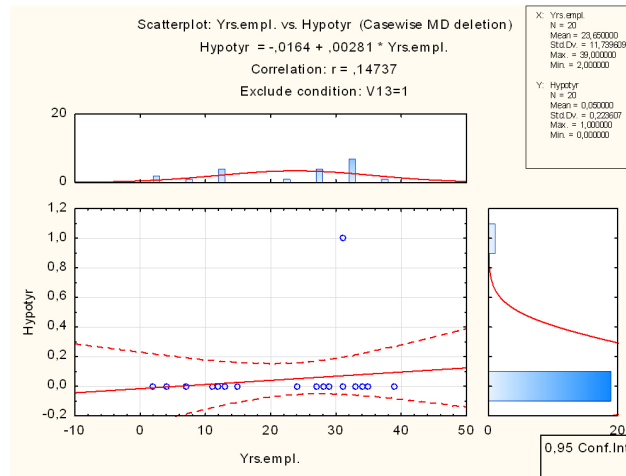


Figure 1. Linear regression analysis – The relation between years of employment and occurrence of hypothyroidism
There is a slight increase of hypothyroidism according to the years of employment in nurses of the pediatric hospital department

Absence from home leads to strain and consequently to stress. Nurses, especially pediatric nurses in Intensive Unit dealing with newborns and small children have a very demanding occupation. The fight for life of very ill and vulnerable small patients is very challenging. Parents are also under pressure and they often unconsciously burden hospital nurses out of fear for the health of their children.

Children are very often hospitalized due to viral and bacterial infections, placing hospital nurses somewhat at risk due to contact with such pathogens. Scientists have identified a possible role of viruses as the cause of some thyroid disorders.^[15] Disturbances of the thyroid gland are not harmless and can remain unnoticed for many years. An isolated incident did present a thyroid disturbance that caused a patient's death. This patient had been exposed to elevated stress.^[16] The patient had a diffusely enlarged thyroid gland and cardiomegaly. Hyperthyroidism often leads to supraventricular arrhythmias.^[17] Contrary to that bradycardia and low ECG voltage are present in hypothyroidism. In hyperthyroidism bromazepam treatment is advised if the patient had experienced stressful event.^[18]

As described 14 out of 20 hospital nurses in this study had thyroid gland disturbances. From that number 7 have hypothyroidism, 4 thyroiditis and 3 goiter. Health Care work under certain political rules can be demanding. Managers are under the burden of national leaders who demand a "military regime". It means serious shift work, work during the weekends, all that with the aim to shorten the lists of patients for medical examination.

Articles in the daily press address the devotional work of the

medical staff. Journalists comment that everything will be addressed. However, nobody has mentioned hospital workers *i.e.* nurses who are the first pillar of the healthcare system.

Nurses often continue working when they are ill. Besides hypothyroidism, obesity often appears due to decreased metabolism and the accumulation of fluid. Obesity often causes psychological frustration as it is difficult to reduce body weight when obesity does not depend only on food uptake.

Unhealthy nourishment choices contributes to the obesity. Due to 12-hour shifts nurses often eat when they have time. Many also smoke cigarettes as a method of relaxation. Metabolic syndrome (Mets), a disease composed of different risk factors such as obesity, type 2 diabetes or dyslipidemia is often found among nurses.^[19]

The newest research conducted in Canada has shown that occupational psychological stress does not lead towards obesity, contrary to expectations.^[20] Research has shown that individual factors, such as physical inactivity, strain at home, and consumption of psychotropic drugs influence obesity.

In conclusion, incidence of 14 thyroid gland disturbances out of total 20 pediatric hospital nurses could be considered noteworthy. The effect of coincidence and genetic proneness should be considered especially because at present there is no definitive evidence of a connection between stress and thyroid disturbances. Though there is no proof that there is connection between the stress and thyroid gland disturbances, this paper contributes to the recognition of such problem in the field of direct medical practice. Namely, female pediatric nurses are under the higher levels of stress than other nurses. Among other things they cope with additional stress in relation to other nurses. The pediatric nurses treat and manipulate severely ill children but at the same time they are exposed to concerned parents whose fear become sometimes embarrassing. In the Clinic, parents sojourn is allowed which is good for children and parents, but not for nurses. A special tool for measuring stress is not used except the nurses' medical history and statements about the stress exposures due to children and parents professional relationship. The occurrence of thyroid gland disturbances in the group of pediatric nurses in such numbers, in relation to other nurses, shows enough to medical practitioners. The answer to the question set in Introduction can be given. Polyvalent stress exposure, stress like in other nurses upgraded by upset parents concerned extremely for their children exceeds the nurses' compensation mechanisms and leads to different type of disturbances, primarily of thyroid gland. Consideration should be given to other factors like genetic, autoimmune, random incidence *etc.* However, there is enough space for

the intervention measures by the Occupational Medicine. It is necessary to employ a larger number of pediatric nurses. In that way spaces between shifts could be increased and automatically nurses would be less burdened. Exposure to biological hazards should be considered such as ionizing radiation. From time to time some children must go for an X-ray examination, where additional risks occur. Cytostatics, chemicals, parents, sick children – all that has impact on the nurses. Primary care nurses are significantly less exposed to the mentioned hazards, although their work is not easy, so they sporadically develop hypertension, obesity, diabetes and

other chronic diseases.

Managers are also under the stress of producing positive outcomes. They as well must be educated on how to change their policy. In summary, a sick nurse must go on sick-leave or she might be lost for the healthcare system. Furthermore every day departures of a large number of medical staff to far-away western countries are seen. The money is not the main reason, stress and bad working conditions propel them to leave the country to avoid sickness and different disturbances such as thyroid gland disturbance.

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