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Night work and quality of life. A study on the health of nurses

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Abstract

Background. Job quality and evaluation of workers' health have both medical and social important implications. We studied health-related quality of life (HRQL) in nurses who perform their activity in night shifts.

Methods. A cross-sectional study was conducted between October and November 2014. Nurses who attended night shift in the Siena Teaching Hospital (Azienda Ospedaliera Universitaria Senese – AOUS) were sampled using EpiInfo software (confidence interval 95%) and investigated using the SF-36 Questionnaire. Our results were compared with the Italian general population (Apolone, 1997). A Descriptive analysis was conducted. Wilcoxon test, Pearson coefficient, t-test, Wilcoxon signed-rank test and logistic regression were used for the statistical investigation.

Results. 197 questionnaires were analyzed. Females were 71.7%; mean age was 39.2 years (DS 8.6); smokers were 37.8%. Males scores were higher than those of females in all dimensions of physical and mental health ($p < 0.05$). The time taken to reach the place of work appeared to influence the dimension of General Health (coeff. -0.17); we found a worsening of 0.17 points of this dimension for every minute spent in travel. Men and nurses with more working years had a better score in Physical Pain dimension. AOUS nurses scored significantly ($p < 0.05$) less compared with the correspondent Italian general population in General Health, Energy-fatigue, Social functioning, Physical functioning and Bodily pain.

Conclusions. There is a significant relationship between night work and HRQL of nurses. The health profile of AOUS nurses' ranks below the values of the Italian general population in various dimensions.

Key words
- night work
- quality of life
- nurse

INTRODUCTION

The progressive flexibility of working hours in all market sectors has significantly changed the organization of labour and people's lifestyles. In most industrialized countries, working shifts involve about one-third of the population and one fifth also works at night. According to Eurostat data, in 2012 people aged 15-74 normally employed in night shifts in Italy were 7.4% of the population, compared with a European average of 6.5% [1, 2]. Shift work is often a specific and necessary condition for the provision of health services, especially in hospitals, wards, emergency services and critical areas where it is the only way to ensure continuous service and care of patients. The influence of work on the quality of life is not limited to income but also has a role in identity-building and provides opportunities for social relations. Work occupies a large part of people's lives in terms of time while offering satisfaction, self-realization and psychological as well as economic recompense.

Quantity and quality of work can be measured by indicators, such as unemployment (including long-lasting unemployment) and part-time work. Qualification of work may be evaluated using indicators like income and benefits (incidence of low wages), balance between work and free time (based on the average of hours worked) and occupational safety (incidence of accidents) [1]. The impact of work on quality of life and on workers' health is important from a medical and social

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viewpoint, besides having implications for the economic and psycho-physical well-being of the population. In Latin countries in general, and in Italy in particular, few studies have been conducted on this topic.

Several studies reported negative effects of shift work and night shifts in particular on health [3]. Various aspects have been investigated but, to our knowledge, only a study has investigated whether the time taken to reach the place of work may affect perceived health [4]. Different shift durations, contractual agreements, cultural approaches and lifestyles of different countries all determine significant distinctions in the management of working hours and in the personal, family and social impact on workers' lives.

As previously reported in the literature, shift work may cause sleep disorders, worsen the quality of life of workers and can impact negatively on health [5-9]. The severity of the shift work disorders correlates with the number of night shifts per year, the length of working time and the increase in age [10]. These disorders are related to changes in circadian rhythms, including sleep/wake cycles and fast/feeding cycles [11], which can cause insomnia, obesity, metabolic syndrome, diabetes mellitus [9, 12-14], depression [15], alter physiological arousal and impaired cognitive processes [16]. The literature analysis seems to highlight that people who worked continuously have more psychosomatic symptoms and less psychological well-being than those who did the fractioned journey [4]. In this study, we evaluate whether our data are in accordance with previous studies and whether the time taken to reach work can influence the scores of the 8 scales of SF36.

This study provides an opportunity to shed light on a condition of occupational risk (night work), often underestimated and considered a necessary stage in the occupational career by nurses and health administrations. It investigates the quality of life of nursing staff on night shifts in an Italian teaching hospital. In particular, the aims are: i) to assess the differences between the quality of life of nurses working at night and the quality of life of the general population; ii) to study how some characteristics of the population studied can influence the perceived health.

MATERIALS AND METHODS

Setting

A cross-sectional study design, including an analytical component, was adopted on a sampled population of nurses regularly working night shifts at the Azienda Ospedaliera Universitaria Senese – AOUS (Siena Teaching Hospital).

The Short Form Questionnaire (SF36) with some extra questions useful to detect socio-demographic information was adopted. The data were collected between October and November 2014 after obtaining authorization from the hospital health administration. The hospital units enrolled in the study were identified by consulting the database of the hospital nursing services administration, used for personnel management. To have better estimates we considered all the staff working in the hospital on August 28, 2014. We only excluded nurses who never or just sporadically worked at night.

The number of nurses working in the hospital was 946, divided into 37 units; among them, 586 were involved in night shifts.

Sample

In order to correctly represent the phenomenon that we intended to analyze, we determined the necessary size of the study population. The number of nurses necessary was 193, calculated using EpiInfo software (confidence interval 95%) and the following formula [17]:

$n = [1-(1-a)\ 1/d] \times [N-(d-1/2)]$.

Where n was sample size, a desired confidence interval (95%), d the expected frequency of return of the questionnaire (65%) and N the total number of shift-working nurses.

Questionnaire and data collection

To evaluate the nurses' self-perceived health we used the Italian version of SF36. SF36 was designed in the United States in the mid-eighties. It was successfully translated and adapted culturally in 1991 to countries participating in the International Quality of Life Assessment (IQOLA) project. It is a generic questionnaire on quality of life, composed of 36 items and eight scales: PF, Physical functioning; RP, Role limitation due to physical health problems; BP, Bodily pain; GH, General health perception; VT, Vitality; SF, Social functioning; RE, Role limitation due to personal or emotional problems; MH, Mental health. This instrument was designed to provide an age and gender-specific profile, useful to understand the differences in the physical and emotional status of members of the population on the basis of a point score [18].

The point score of each scale ranges from 0 to 100: a better quality of life earns a higher score. The scales PF, RP, BP, SF and RE define health as absence of limitations or disabilities. In these scales, the maximum score of 100 is given for no limitations or disabilities. The scales GH, VT and MH are bipolar and measure a broader range of positive and negative states of health. In these scales, an intermediate score is earned by subjects who do not report any limitation or disability, whereas a score of 100 is earned by subjects who report excellent health [19].

Besides the information requested by SF36 we also collected the following data: i) marital status: unmarried/married, married/living together, separated/divorced; ii) age; iii) partner also doing shift work: yes/no; iv) children: number and age; v) smoker: yes/no; vi) commuter: yes/no; vii) time taken to travel to work; viii) total years of service; ix) years of service involving shift work; x) years of service with the current hospital unit.

To administer the questionnaire we contacted all the Nursing Coordinators of the units involved in the study, providing information on the aim of the research. Anonymity was guaranteed by law and the data was only to be used for statistical and scientific purposes. The printed questionnaires consisted of two pages: i) an informative note and a section for socio-demographic data (page 1); ii) the questionnaire (SF36), to be filled directed by the nurses, anonymously, (pages 2 and 3, printed on both sides of the paper).

The Nursing Coordinator was asked to deliver the questionnaires to the nurses and to instruct them. The questionnaires were returned at different times. Many visits were necessary to remind the nurses to fill them in, and to complete collection, in order to minimize the chance of missing data. The number of questionnaires was distributed in proportion to the number of nurses in each unit.

The frequency distribution of travelers was calculated according to time taken, which was organized into five classes: up to 29 minutes (class 1) 37.6%; 30-59 minutes (class 2) 23.8%; 60-89 minutes (class 3) 8.1%; 90-120 minutes (class 4) 1% and more than 120 minutes (class 5) 0.5%. About a third of the nurses (28.9%) did not answer this question.

Data management

Each questionnaire had a tracking code to ensure the anonymity of the respondent. The completed questionnaires were processed and the data stored in a single database containing the demographic aspects and the results of the eight SF36 scales that had been previously calculated. Points were assigned to the eight scales of SF36 using the program ProfiSalute, developed by the Health Services Management Laboratories of the University of Siena. The program enabled to: i) enter data; ii) calculate point scores by summing the replies to the questions of each scale (raw point score); iii) convert of raw point scores of the scales to scores between 0 and 100 (converted scores).

Data analysis

The values obtained for each of the eight scales were entered in the appropriate field. Percentages, means, minimum and maximum value, medians and standard deviations were calculated for descriptive graphs and tables.

All socio-demographic variables (age, marital status, partner on shift work, travelling time, overall years of service, years of shift work and years of work in the same unit) were analysed against the eight scales of SF36 (dependent variables). Outcomes variables in which was assessed normality, using frequency distribution analysis and the formal test of Shapiro-Wilk, were studied with multiple linear regression. The final models of these scales were obtained with the back forward elimination method after it was previously assessed the role of the covariates which highlighted statistical differences ($p < 0.05$) in a simple linear regression. The unpaired t-test was used for comparing means.

Not normally distributed dependent variables were studied with Spearman's rho correlation coefficient which investigated the strength of the relationship between the ordinal variables and the scores of the 8 scales; Mann-Whitney test was used to compare medians for dichotomous covariates.

The t-test was used also to compare means of scales, after Shapiro-Wilk test assessment, with mean reference of the Italian population. Wilcoxon test was used to compare medians of scales having a non-normal distribution with the reference median value of the Italian population.

The data provided by the questionnaires was organised and processed with software Stata® SE, version 12.1 (StataCorp, College Station, Texas, USA). Significance was set at $p < 0.05$.

RESULTS

The total number of questionnaires distributed was 257 and 211 (82.1%) were returned. The number from which the scores of the various scales could be calculated was 197 (76.7%). In the study population, the percentage of females was 71.7% and the mean age was 39.2 years (SD 8.6 years). Most were married or living with a partner (61%), 32% were single and 7% were separated or divorced; 40% of nurses had a shift-working partner; 52.8% had no children, 23.4% had one, 20.3% had two and 3.5% had three or more children; 37.8% were smokers. 46.4% of the studied population usually travelled to work by car, taking from a minimum of 5 minutes to a maximum of 200 minutes. General health perception deteriorated with increasing travelling time: for every additional 2 hours of travel, this parameter declined by -19.2 points ($p = 0.027$).

As shown in *Table 1a*, total years of service ranged from minimum of 2 years to a maximum of 41 years; 43% of the sample had 0-10 years working experience,16.2% of the sample had 11-15 years of service and18.3% had 16-20 years of work.

Years in shift work ranged 0-10 for 45% of the nurses and 11-20 for 36% of them. For years of service in the current unit: 30% of the sample had been working in

Table 1a
Service in the current unit, shift work, total years of service by years and number of nurses

	Years	N. nurses (%)
Total years of service	0-10	85 (43.1)
	11-15	32 (16.2)
	16-20	36 (18.3)
	21-25	15 (7.6)
	26-30	20 (10.2)
	31-40	8 (4.1)
	41+	1 (0.5)
Shift work	0-10	88 (44.7)
	11-20	70 (35.5)
	21-25	17 (8.6)
	26-30	13 (6.6)
	31-40	8 (4.1)
	40+	1 (0.5)
Service in the current unit	<5	59 (29.9)
	5-10	73 (37.1)
	11-15	31 (15.7)
	16-20	16 (8.1)
	21-25	11 (5.6)
	26-30	6 (3.1)
	31-40	1 (0.5)

Table 1b
Scales of SF36 by item, mean, SD, IC 95%, median, val. min, val. max scores (sample nurses Azienda Ospedaliera Universitaria Senese – AOUS)

Scales	Items	Mean	SD	IC 95%		Median	Val. min	Val. max
PF	10	87.36	14.7	85.2	89.42	90	30	100
RP	4	68.78	25.3	63.8	73.75	75	0	100
BP	2	67.59	21.5	64.57	70.61	72	22	100
GH*	5	61.42	18.7	58.78	64.05	62	15	100
VT*	4	54.39	17.4	51.93	56.84	55	5	100
SF*	2	61.65	21.1	58.68	64.61	62.5	0	100
EL	3	66.84	37.8	61.51	72.15	100	0	100
MH	5	65.11	16.4	62.79	67.42	64	8	100

PF, Physical functioning; RP, Role limitation due to physical health problems; BP, Bodily pain; GH, General health perception; VT, Vitality; SF, Social functioning; RE, Role limitation due to personal or emotional problems; MH, Mental health. * normally distribuited.

the same unit for <5 years and 37% for 5-10 years. The point scores for the eight scales of SF36 are shown in *Table 1b*.

The GH scale, at the crude analysis, showed to be significantly and negatively influenced by travelling time, overall years of services, years of shift works, years of work in the same unit and age *(Table 2)*. However, at the multivariate analysis, only travelling time (p = 0.012; coeff. = -0.17), years of services (p = 0.002, coeff. = -0.56), and gender (p = 0.002; coeff. = 11.05) resulted significantly associated. Males score was 11.05 times higher than women.

In the VT scale, (vitality) which describes the subjective perception of physical and mental health, the children number (p = 0.035; coeff. = 2.82), the overall years of service (p = 0.017; coeff. = -0.34), and gender (p <0.001; coeff. =11.11) were significantly associated at the multivariate analysis.

In the SF scale, related to the interference between physical and emotional problems and social functioning, the multivariate analysis highlights a significant association with years of shift work (p = 0.007; coeff. = -0.63), years of work in the same unit (p = 0.008; coeff. = 0.72), and gender (p <0.001; coeff. = 11.95).

The PF scale measures the capacity for heavy physical work such as running, lifting weights or sporting activity. Significant differences (Spearman e Mann-Whitney) were found with male nurses (p = 0.0002) and nurses whose partners did shift work (p = 0.0341): these subjects achieved higher scores than their counterparts (female nurses and nurses whose partners did not do shift work). Regarding this scale, nurses with longer working experience (p <0.001; rho = -0.40), with many years' experience of shift work (p <0.001; rho = -0.40), longer service in the same unit (p <0.001; rho = -0.31), and older ages (p <0.001; rho = -0.33) had lower point scores.

The RP scale measures the limitations or disabilities that may prevent a person from working or performing usual activities. Males scored significantly higher (median 75 for females and 100 for males), indicating significantly fewer work-related physical health problems (p = 0.012).

The BP scale measures pain interference with normal activities. The results showed significant values for the following variables: marital status (p = 0.0018), gender (p = 0.0008), number of children (p = 0.0017), years of service (p <0.001), years of shift work (p <0.001), years of service in the same unit (p = 0.0052) and age (p < 0.001).

The EL scale assesses the presence/absence of interference with working activity due to the emotional condition. In our study it is associated (p = 0.0138) with more years of service in the same unit.

The MH scale measures different components of emotional health relating to skills and well-being. Males seemed to enjoy better mental health than females (median 64 for females and 72 for males) (p = 0.0188).

The means of the GH, VT and SF scales, having a normal distribution, when compared with the corresponding means of the Italian population, showed significant differences *(Table3a)*. The medians of the scales, PF and BP, not normally distributed, were significantly different from the corresponding Italian medians *(Table 3b)*.

A further comparison was performed in the study population, stratifying by age groups, compared to the national population.

Figure 1 shows the values of the eight scales for subjects of the different age groups. In the group 25-34 years significant differences were found for the scales: BP (p <0.001), GH (p <0.001), VT (p <0.001), SF (p <0.001), MH (p = 0.001). In the age group 35-44 years, significant differences in the PF (p < 0.001), BP (p < 0.001), GH (p = 0.045), VT (p <0.0139) and SF(p < 0.001) scales emerged.

In the age group 45-54 years, all scales showed significant differences. In the age group 55-64 years significant differences were only found for GH (p = 0.0094), VT (p = 0.0047) and SF (p <0.001).

DISCUSSION

The aim of the present study was to investigate the relation between night work and health status of nurses. More specifically, we looked for a relationship between socio-demographic variables and nurses' health. The

Table 2
Coefficient, CI 95% and P-value of crude and adjusted analysis of the covariates with the scales General health perception, Vitality and Social functioning

Crude analysis	General health perception				Vitality				Social functioning			
	Coeff	IC 95%		P	Coeff	IC 95%		P	Coeff	IC 95%		P
Children number	-1.62	-4.39	1.15	0.25	0.96	-1.62	3.55	0.46	0.37	-2.76	3.50	0.82
Travelling time	-0.16	-0.29	-0.18	**0.027**	0.05	-0.79	0.17	0.48	0.08	-0.07	0.23	0.29
Overall years of services	-0.51	-0.79	-0.22	**0.001**	-0.27	-0.55	0.003	0.52	-0.19	-0.52	0.15	0.27
Years of shift work	-0.51	-0.81	-0.20	**0.001**	-0.28	-0.57	0.02	0.051	-0.23	-0.58	0.12	0.19
Years of work in same unit	-0.49	-0.84	-0.13	**0.007**	-0.27	-0.61	0.06	0.11	0.12	-0.28	0.53	0.60
Age	-0.44	-0.74	-0.14	**0.004**	-0.16	-0.44	0.13	0.29	-0.01	-0.36	0.34	0.96
Crude analysis	**General health perception**				**Vitality**				**Social functioning**			
	Mean	**IC 95%**		**P**	**Mean**	**IC 95%**		**P**	**Mean**	**IC 95%**		**P**
Gender	-10.0	-15.77	-4.25	**0.0007**	-10.7	-16.03	-5.45	**0.0001**	-11.1	-17.55	-4.72	**0.0008**

Adjusted analysis	General health perception						
	Initial model				Final model		
	Coeff	IC 95%		P	Coeff	IC 95%	P
Children number	0.85	-2.69	3.86	0.73	–	–	–
Travelling time	-0.18	-0.31	-0.04	**0.01**	-0.17	-0.30 0.04	**0.012**
Overall years of services	-0.61	-1.95	0.73	0.37	-0.56	-0.90 0.22	**0.002**
Years of shift work	0.08	-1.25	1.40	0.91	–	–	–
Years of work in same unit	-0.21	-0.78	0.36	0.47	–	–	–
Age	0.10	-0.71	0.90	0.81	–	–	–
Gender	10.73	3.52	17.94	**<0.01**	11.05	4.16 17.94	**0.002**
Adjusted analysis	**Vitality**						
	Initial model				**Final model**		
	Coeff	**IC 95%**		**P**	**Coeff**	**IC 95%**	**P**
Children number	3.44	0.47	6.41	**0.02**	2.82	0.20 5.44	**0.035**
Travelling time	0.40	-0.08	0.16	0.53	–	–	–
Overall years of services	-0.65	-1.86	0.57	0.29	-0.34	-0.62 -0.63	**0.017**
Years of shift work	0.31	-0.89	1.52	0.61	–	–	–
Years of work in same unit	-0.14	-0.66	0.37	0.59	–	–	–
Age	-0.03	-0.76	0.69	0.93	–	–	–
Gender	10.44	3.91	16.98	**<0.01**	11.11	5.85 16.37	<0.001
Adjusted analysis	**Social functioning**						
	Initial model				**Final model**		
	Coeff	**IC 95%**		**P**	**Coeff**	**IC 95%**	**P**
Children number	1.69	-1.85	5.23	0.35	–	–	–
Travelling time	0.08	-0.07	0.23	0.30	–	–	–
Overall years of services	0.04	-1.41	1.49	0.96	–	–	–
Years of shift work	-0.82	-2.25	0.61	0.26	-0.63	-1.08 -0.17	**0.007**
Years of work in same unit	0.60	-0.02	1.22	0.06	0.72	0.19 1.26	**0.008**
Age	0.19	-0.68	1.05	0.67	–	–	–
Gender	12.84	5.06	20.62	**<0.001**	11.95	5.57 18.33	**<0.001**

Table 3a
Health scales of SF36 showing normal distribution: comparison mean of Italian population and sample

Scales	Mean Italian population	Mean sample AOUS	P	IC 95%	
GH	65.22	61.42	0.0049	58.78	64.05
VT	61.89	54.39	0.0001	51.93	56.84
SF	77.43	61.65	0.0001	58.68	64.62

Table 3b
Health scales of SF36 showing non-normal distribution: comparison median of Italian population and sample

Scales	Median Italian population	Median sample AOUS	P
PF	95	90	0.0033
RP	100	75	N.S.
BP	84	72	0.0001
EL	100	100	N.S.
MH	68	64	N.S.

AOUS: Azienda Ospedaliera Universitaria Senese.

results confirm that the nurses in our sample enjoyed poorer health than the Italian general population.

The percentage of questionnaires returned was in line with similar studies [20, 21] and the composition of our sample was similar in regards to gender and age [2, 4, 20]. With regard to marital status, the percentage was similar to that found by Montesinos *et al.* [4] with a large majority of married or de facto married nurses (61%) whereas the percentage of single persons was greater in our sample, with 32% versus 21.3%. The percentage of separated/divorced persons in our sample (6.5%) was lower than in other studies [4, 21] and higher than in the study of Soric *et al.* about Croatian nurses [22]. Soric *et al.* also found that older and unmarried nurses have lower scores on the scales of social interactions [22]. Otherwise, in our sample, the Social functioning scale was influenced by gender, years of shift work, and years of work in the same unit, but not by age and marital status.

The study by Dargahi *et al.* [2] showed that married nurses who do night shifts can be at higher risk of family tensions than unmarried nurses. The mechanism is probably related to changes in family routine and amount of time spent together [23]. In our study, we did not specifically investigate the presence of family tensions, but in accord with other studies [4, 20, 21, 23, 24], we found that the number of children has an impact on the VT scale; for each extra child, the Vitality scale increased by 2.82 points. The percentage of childless nurses was 52.8%: although this percentage is high, it is still lower than the 70.2% reported by Shu-Yu Tai *et al.* among nurses working in night shifts. This result is noteworthy because it suggests that shift work and night shifts could be factors that do not encourage maternity and paternity [23].

To our knowledge, travelling to work was only considered in one previous study [4], which examined whether travel was continuous or whether it involved a change in the mean of transport. A continuous journey had a negative influence on psychological well-being. Our results pointed out that time taken in travelling to work was significantly associated with the GH scale. In commuters (namely, workers spending more than 2 hours in total between the outward and return journey [25, 26]) this scale worsens -19.6 points for every additional 2 hours of travelling time.

With respect to total years of service, more than 40% of our sample was composed of nurses with 0-10 years of working experience which is similar to the mean length of service of other researchers [4, 27].

The demographic and occupational characteristics of our sample were similar to those of other studies conducted on the health of nurses using SF36; this is a major indication of the validity of our results. The socio-demographic variables of our sample correlated with the scores of the SF36 scales and confirmed the results of other studies [4, 20, 28]. In a sample of Greek nurses, Tountas *et al.* showed that men scored significantly higher than women on all dimensions of SF36. The gender differences found by Tountas *et al.* are in accordance with our results except for RE. In their sample, the mean scores for the eight scales were much lower than the reference data of the US population and many populations of European countries. Their results showed a health profile that, although lower than European reference data, was nevertheless higher than the results obtained by our study in all scales of the SF36 except PF [20].

The GH scale showed significant relations with almost all the socio-demographic variables, as in the study by Tountas *et al.* [20]. We observed an interesting relation relation between years of working experience and BP, namely reduced pain perception with increasing years of working life. The same result was recorded by Tountas *et al.* [20]. Pain perception studies are controversial regarding the relationship between age and pain. The experience of pain is subjective, changes with age and involves both cognitive processes and experience [29, 30].

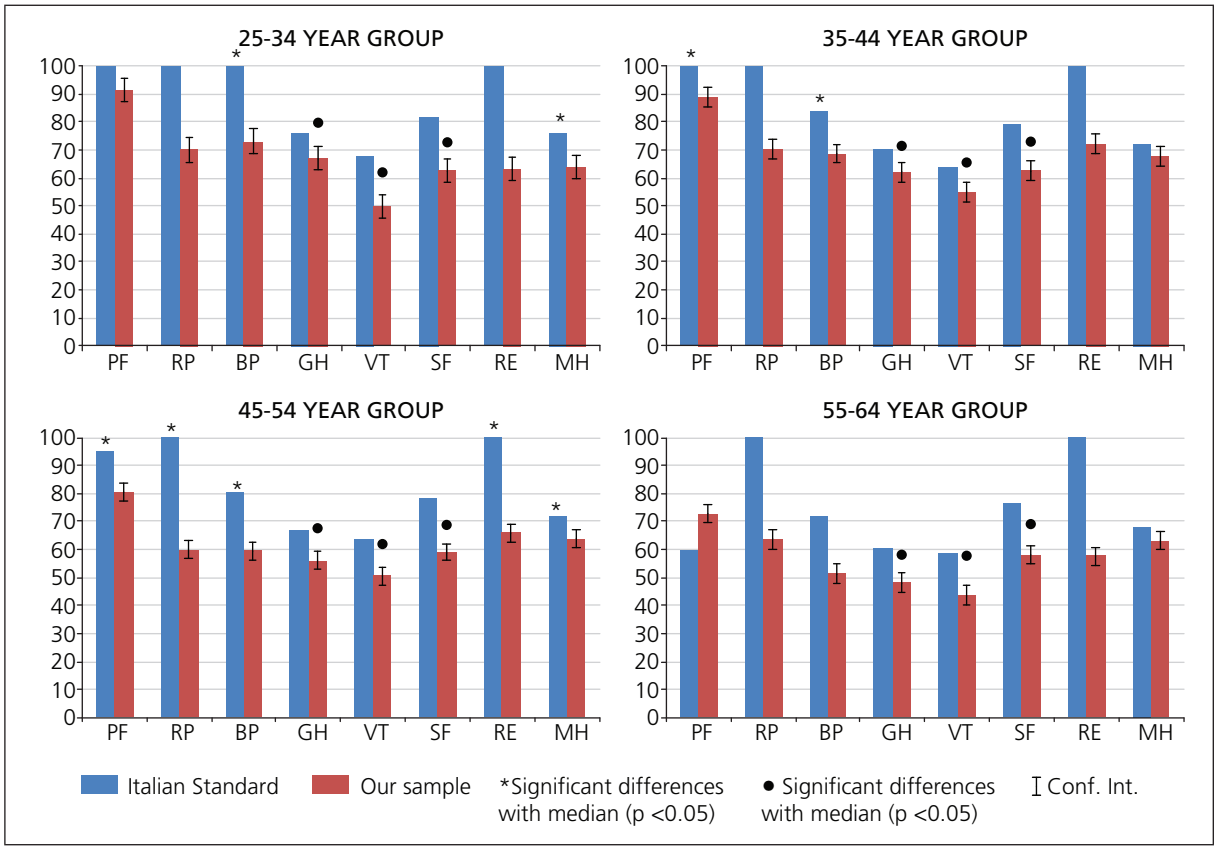

Figure 1
Comparison of our sample and Italian Standard stratified by age group.

The SF and VT scales, besides showing significant gender differences, were absolutely coherent with the results of other studies. Indeed, in a study involving nurses as well as administrative staff, doctors, technicians and auxiliary personnel, Tountas *et al.* concluded that nurses showed poorer health status in all SF36 scales than male nurses. Poor health and health-related quality of life reflect the difficulties they encounter on a daily basis and above all the difficulty of being a woman in a highly competitive and male-dominated field [20]. This hypothesis is also sustained by the lower score of nurses for SF.

The health profile of our sample was inferior to that of the Italian general population and also lower than it would be expected in a healthy population that undergoes medical check-ups of fitness for night work every two years.

The difference in female health profile in the scales RP, VT, SF, RE was also significant compared with the general population of Italy. These results are in line with the Italian study by Klersy *et al.* on dialysis centers that found results in line with means of the Italian population, except for a slightly lower score for SF [21].

Moreover, comparing the present results on health profile with those of Budge *et al.* [24], we notice that Siena nurses had lower health status than the New Zealand sample, although we also have to consider that means for the NZ population are higher than those of the Italian reference population.

We were unable to compare our results with those obtained by other studies on quality of life of nurses in Italy by means of questionnaires that assess health status. In fact, compared to the rich international literature on the negative effects of working at night, the literature for nurses is somewhat lacking. In addition, some studies have evaluated aspects that we did not investigate. For example, Kim *et al.* highlighted that working women involved in night shift work have lower Health-Related Quality of Life (HRQoL) profile compared to women working during the day [6].

As regards psychological disorders Tahghighi *et al.* did not find definitive evidence that shift work is associated with poorer psychological functioning in nurses. They highlight that the impact of shift work is dependent on several contextual and individual factor; also they suggest that more studies are needed in order to compare the psychological outcomes and resilience of nurse shift workers with no shift workers [31].

Giorgi *et al.* investigated any possible relationship between sleep disorders, burnout and job performance in a shift-work sample of nurses. They showed that female gender and personal burnout were significantly associated with impaired sleep quality. A significant negative association between patient-related burnout and job performance was found [32]. Puerta *et al.* reported that night shift nurses had significantly worse sleep quality (80.6% had bad perceived sleep quality) than nurses working mornings (41%) and evenings (44.4%) [7].

These results disagree with the findings of Palhares *et al.* where night shift work is not associated with impaired sleep quality when compared to other work shifts. They suggest that other factors, like age and lower education level, influence negatively sleep quality. In fact in the model adjusted for age, it was found that night-shift work is associated with severe worsening of sleep quality [33] in accordance with another study [34].

Also, Asaoka *et al.* investigated the effects on sleep in nurses working with rapid-rotation schedules. The results suggest that missing napping opportunities during night work, long night time working hours, and delay of circadian rhythms are associated with sleeping disorders [8].

LIMITS

The limits of our study include a reference population data ten years older than the study sample. This could have affected a correct interpretation of the results but still are the most updated data that we have available. Another limit is the higher than expected number of questionnaires that were not returned, that is almost 1/5 of the sample (18%). The reasons for this could be due to the laxity of the Nursing Coordinator in promoting participation. We noted that two of the units, both in the same surgical field and with the same number of nurses, returned very different percentages of questionnaires: 70% *versus* 20%. However, we also observed the same pattern in two other units with the same coordinator: 72% *versus* 46%. This suggests that the need to train the coordinator to make him understand the importance of his role in motivating the completion of the questionnaires.

Another limitation may be the absence of a control group to compare data with those of workers not working at night.

CONCLUSIONS

The study highlighted a possible relationship between night work and the health of nurses. We have found that commuting can adversely affect health; this variable seems to be underestimated and it is consistent with the only data we have found in the literature [4]. Therefore, further studies may be necessary to investigate this issue further.

Protection of the health of shift workers cannot be limited to the monetary compensation envisaged by collective labour contracts and health surveillance. It is absolutely necessary to redesign the organization of labour, recognizing the fundamental role of nurses in healthcare. In recent years, health authorities have attempted to save costs and improve efficiency as imposed by economic policies that emulate industrial models of productivity which have little, if anything, to do with health.

Nurses are trained to help improve the quality of life of patients, but their quality of life seems to be ignored. Quality of life is essential to improve quality of healthcare and has a direct influence on other aspects, such as health, absenteeism, accidents, productivity and loyalty to the organization [27]. The health profile of Siena University Hospital nurses showed lower scores than those of the general population of Italy, and these disadvantages are hardly compensated by additional pay for doing night shifts. The results of this study offer material for reflection on how to improve and promote the health of all healthcare professionals.

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Conflicts of interest

None to declare.

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