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Risk of dry eye and ocular dryness in intensive care: a cross-sectional study

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ABSTRACT

Aim: verify the relationship between risk factors and clinical data with the nursing diagnosis of dry eye risk and ocular dryness in adult patients admitted to the intensive care unit (ICU). **Method:** it is a cross-sectional pilot study performed at the ICU of a public hospital between October and December 2015. **Results:** Statistically significant relationships with the nursing diagnosis under study and the following risk factors and clinical data were observed: therapy with mechanical ventilation, neurological lesions with sensory loss, motor reflex, Schirmer test and length of hospital stay. Burns, use of vasoactive drugs, Schirmer test and days of hospitalization also showed a significant relation with ocular dryness. **Conclusion:** the results suggest that some risk factors and certain clinical data may present a greater relationship in the ICU environment. **Practical implications:** the knowledge provided can support the planning of interventions aimed at avoiding visual impairments.

Descriptors: Nursing Process; Nursing diagnosis; Dry Eye Syndromes; Intensive Care Units.

DIFFERENTIAL RESEARCH

| | |
|--------------------------------|--|
| What do you know? | Dry eye is prevalent in intensive care units and is associated with certain risk factors and clinical data. |
| Contribution to what is known? | Mechanical ventilation, neurological lesions with sensorial loss of motor reflex, chemosis, use of vasoactive drugs, Schirmer test and days of hospitalization show a relation with the risk of dry eye and/or ocular dryness. |

OBJECTIVE

To verify the relationship between risk factors and clinical data with the nursing diagnosis of dry eye risk and ocular dryness in adult patients admitted to the intensive care unit (ICU).

METHOD

This is a cross-sectional pilot study from a larger project carried out in the adult ICU of a public hospital of reference in medium and high complexity, located in the Brazilian Northeast, between October and December 2015.

With the use of the pilot collection it was possible to test the instrument of data collection and to make the necessary adjustments for the beginning of the research, the average time for collection per patient (30 minutes), to structure the database and, mainly, to calculate the final sample (206 patients) of the larger project with the prevalence data of the nursing diagnosis under study, collected between January and July 2016.

Thirty patients (60 eyes) were selected consecutively and for convenience. Eligible patients met the following inclusion criteria: they were admitted to the ICU of the referred hospital with an inpatient period of more than 24 hours, were

aged 18 years or more and had no eye damage or treatment at the time of data collection. Patients with agitation or in life-threatening emergencies were excluded during data collection.

An instrument was used that contained variables related to sociodemographic and clinical data, and risk factors for the nursing diagnosis of dry-eye risk described in NANDA-International's Taxonomy II⁽¹⁾. The inference regarding the presence of the diagnosis in the evaluated patients was performed by a pair of diagnostic nurses with experience in diagnostic judgment and in the ICU. In case of divergence between the presence and absence of diagnosis, it was resolved by consensus. A Kappa coefficient of 0.81 was identified among the diagnostic nurses, that is, almost perfect agreement.

The inference of ocular dryness in ICU patients was as follows: presence of an insufficient volumetry test (Schirmer I <10 mm) associated with a positive clinical sign (ocular hyperaemia and/or mucous secretion).

To analyze the data, the Statistical Package for Social Sciences (SPSS) version 20.0 was used for testing, which included the descriptive statistics through frequencies, measures of the distribution center and their variabilities. The normality of the data was verified using the Shapiro-Wilk test confirmed by individualized analyzes of asymmetry, kurtosis, histogram, Quantil-Quantil (Q-Q Plot) and Boxplot. For associative measurements of the nominal categorical data, the Pearson Chi-square test was used and when the expected frequencies were less than five, Fisher's exact test was applied. To compare means, Student's t-test was applied for independent samples. In case of asymmetry, the Mann-Whitney test was used. In all tests, there was a significance level of 5% ($\alpha = 0.05$).

It is noteworthy that written consent was obtained from each participant or family member responsible. A favorable opinion was

obtained from the Research Ethics Committee through the institutional council under number 918.510 and CAAE 36079814.6.0000.5537. This study was funded by the National Council for Scientific and Technological Development - CNPq (case number 444290/2014-1).

RESULTS

Regarding the sociodemographic and clinical profile, 63.3% were female with an average of 61.6 (± 14.4) years of age; 73.3% were hospitalized in the ICU due to the postoperative recovery. Regarding comorbidities, systemic arterial hypertension and diabetes mellitus were highlighted, identified in 66.7% and 43.3% of the patients, respectively. Of the 60 evaluated eyes, 13 (21.7%) presented dry eye risk, as shown in table 1.

Table 1. Prevalence of nursing diagnosis of dry eye and ocular dryness in the pilot study, Natal, 2016. (n=60)

| Variables | N | % |
|----------------------|-----------|--------------|
| Risk of dry eye - OD | 8 | 13,4% |
| Risk of dry eye - OS | 5 | 8,3% |
| Total | 13 | 21,7% |
| Eye dryness - OD | 22 | 36,7% |
| Eye dryness - OS | 25 | 41,6% |
| Total | 47 | 78,3% |

Subtitles: OD: *oculus dextrus* (right eye); OS: *oculus sinistre* (left eye).

As for the risk factors among patients with dry eye risk, 100% were exposed to environmental factors (air conditioning use) and to the treatment regimen (use of antihypertensives and/or antihistamines and/or diuretics and/or steroids and/or antidepressants and/or analgesics and/or sedatives), 69.2% for females and for lifestyle (smoking and/or caffeine use), 38.5% for aging, 7.7% for therapy with mechanical ventilation ($p=0.021$) and neurological lesions with

sensory motor loss ($p=0,021$). The Schirmer test obtained a median of 18 millimeters ($p<0.001$). The median length of hospital stay was two days ($p=0.020$), and the mean number of blinks per minute was 9.62 (± 6.35), as shown in Table 2.

Among the 78.3% of the eyes that presented the clinical diagnosis of ocular dryness, 40.4% had hyperemia, 27.7% had chemosis ($p=0.052$) and 25.5%, 19.1%, and 17.0% presented mucus secretion, lagophthalmia and eyelid edema, in this order. Among those affected, 44.7% were exposed to the use of invasive mechanical ventilation and made use of intravenous vasoactive drugs ($p=0,041$). The use of sedatives was present in 27.7% of patients with dryness. The Schirmer test had a median of 4 millimeters ($p<0.001$). The median number of days of hospitalization was 6 days ($p=0.020$). The median number of blinks per minute was 5, according to Table 3.

DISCUSSION

In other studies performed in the ICU, the prevalence of ocular dryness varied between 19.2% and 32.2%^(2,3). Regarding the presence of risk factors for the nursing diagnosis under study, it is known that environmental factors, such as air humidity and air conditioning use, and the treatment regimen, such as the use of angiotensin-converting enzyme inhibitors, antihistamines, diuretics, steroids, antidepressants, analgesics, sedatives and neuromuscular blockers, influence the dryness of the ocular surface⁽¹⁾.

In addition, the use of mechanical ventilation may cause conjunctival edema as an adverse effect and consequently the incomplete closure of the eyelids. Furthermore, the use of positive final expiratory pressure (PEEP) may compromise the eye for causing altered ocular perfusion^(4,5).

Table 2. Characterization of risk factors and clinical data identified in patients with the nursing diagnosis of dry-eye risk in the pilot study, Natal, 2016. (n=13).

| Risk factors | N | % | Statistics |
|---|----|--------|------------|
| Environmental factors | 13 | 100,0% | - |
| Treatment regimen | 13 | 100,0% | - |
| Women | 9 | 69,2% | p=1,0002 |
| Lifestyle | 9 | 69,2% | p= 0,3471 |
| Aging | 5 | 38,5% | p=0,5581 |
| Mechanical ventilation therapy | 1 | 7,7% | p=0,0212 |
| Neurological lesions with sensory loss motor reflex | 1 | 7,7% | p=0,0212 |

| | Mean | Standard deviation | Median | Minimum | Maximum | P value* | Statistics |
|-----------------------------|-------|--------------------|--------|---------|---------|----------|------------|
| Schirmer | 19,68 | 8,65 | 18 | 08 | 35 | 0,107 | p=<0,0013 |
| Days of hospitalization | 2,77 | 2,55 | 02 | 01 | 10 | 0,001 | p=0,0204 |
| Number of blinks per minute | 9,62 | 6,35 | 12 | 00 | 17 | 0,055 | p=0,6733 |

Subtitles: ¹Pearson's Chi-Square Test; ²Fisher exact test; ^{*}Shapiro-Wilk Test; ³Student t test; ⁴Mann-Whitney U Test.

Table 3. Characterization of ocular evaluation and clinical data identified in patients with ocular dryness in the pilot study, Natal, 2016. (n=60).

| Variables | N | % | Statistics |
|-------------------------------------|----|-------|------------|
| Ocular evaluation | | | |
| Hyperemia | 19 | 40,4% | p=0,7492 |
| Chemosis | 13 | 27,7% | p= 0,0522 |
| Mucous secretion | 12 | 25,5% | p=0,4852 |
| Lagophthalmia | 9 | 19,1% | p=0,4362 |
| Eyelid edema | 8 | 17,0% | p=0,1822 |
| Clinical data | | | |
| Invasive mechanical ventilation | 21 | 44,7% | p=0,1591 |
| Use of intravenous vasoactive drugs | 21 | 44,7% | p=0,0411 |
| Use of sedatives | 13 | 27,7% | P=0,4812 |

| | Mean | Standard deviation | Median | Minimum | Maximum | P value* | Statistics |
|-----------------------------|-------|--------------------|--------|---------|---------|----------|------------|
| Schirmer** | 6,93 | 8,50 | 04 | 01 | 35 | <0,001 | p=<0,0013 |
| Days of hospitalization | 9,16 | 10,28 | 06 | 01 | 39 | <0,001 | p=0,0203 |
| Number of blinks per minute | 11,00 | 12,91 | 05 | 00 | 45 | <0,001 | p=0,5973 |

Subtitles: ¹Pearson's Chi-Square Test; ²Fisher exact test; ^{*}Shapiro-Wilk Test; ³Mann-Whitney U Test.

Neurological lesions with reflex sensory motor loss, with consequent lagophthalmia and/or lack of spontaneous reflex of the blinking, also constitute as risk factors that influence ocular dryness. The reduction or lack of spontaneous reflex limits significantly in the cleaning and removal of microorganisms from the ocular surface⁽⁶⁾. Lagophthalmia is the main predisposing factor for diseases of the ocular surface, including ocular dryness⁽⁴⁾. Other research performed at the ICU reported that changes in the cornea were more present when associated with lagophthalmia⁽⁷⁾.

It should be noted that deficiency in lacrimal production may result in hyperemia, which has been shown to be a predictor for the development of dry eye. In addition, as previously mentioned, the chemosis (conjunctival edema) can cause incomplete palpebral closure and consequent instability of the tear film⁽⁸⁾. Moreover, a study reports that patients who use sedatives and vasoactive drugs have important changes in the tear film⁽⁹⁾.

As observed, the reduction of lacrimal volumetry in patients with ocular dryness verified by the Schirmer test demonstrated a statistically significant relationship. Moreover, hospitalization time is a risk factor for ocular changes, since critical ICU patients are predisposed to lose their natural eye protection mechanisms⁽⁶⁾. However, it is worth noting the limitations of the present study in relation to the sample size and the design used, since it does not permit inferences of cause and effect.

CONCLUSION

The results point to the presence of significant relationship between risk factors with mechanical ventilation and neurological lesions with sensory loss motor reflex and the diagno-

sis of nursing risk of dry eye. Other significant clinical data in the ICU included chemosis, use of vasoactive drugs, Schirmer's test and days of hospitalization.

PRACTICAL IMPLICATIONS

The risk factors and clinical predictors identified in ICU patients, especially those with statistical significance, may support the planning of interventions aimed at avoiding visual impairment by taking into account the global eye health action plan for the period from 2014 to 2019 of the World Health Organization⁽¹⁰⁾.

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