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Abstract

Diagnosis of child abuse and neglect is a challenging matter: in case of misdiagnosis, the child cannot benefit from an early treatment; erroneous interpretation may generate legal issues. Some studies reported physicians' lack of knowledge in child abuse and neglect. However, it is not clear if the reasons of this lack relay on an insufficient preparation of students during medical school and/or a deficiency in continuing medical education during/after fellowships. For these reasons, the authors of the present manuscript administered a questionnaire to last year medical students to: evaluate the degree of knowledge on this thematic in a medical student sample; understand if the abovementioned lack may be due to insufficient preparation of students during medical school. Study population included 179 students. The 77.7% demonstrated a low knowledge of this thematic, but they showed a high insight of their lack. The authors pointed out that medical school education can represent a weak point in future medical doctor knowledge on child abuse and neglect. It also allowed to identify as study sample's medical students had high awareness of their lacks in this field. In addition, comparison of medical schools from different geographical areas suggested common issues independent of which accreditation system is implemented. Thus – independent of which corrective strategy will be planned – the study highlighted necessity for each medical school to define: its current ability to properly train students in child abuse and neglect; students' awareness of their level of expertise. This can help schools to identify the most suitable correctives.

Highlights

- Diagnosis of child abuse and neglect is a challenging matter.
- Literature reports insufficient preparation of med students in this field.
- The authors administered a questionnaire to last year medical students.
- Results showed that medical school education can represent a weak point.
- Corrective strategies should be planned.

Keywords: Child abuse; Neglect; Medical school; Continuing medical education; Medical students; Medical doctors.

1. Introduction

Child abuse and neglect are widespread social and medical issues which often go unreported, despite being associated with significant morbidity and mortality [1]. According to the 29th report of the Children's Bureau, Child Protective Service Agencies of the United States received more than 4 million referrals of suspected child maltreatment in 2018, involving approximately 7.8 million children [2].

In medical routine, diagnosis of child abuse and neglect is a challenging matter because of the following reasons: in case of misdiagnosis, the child cannot benefit from an early treatment, which may result in developing psychiatric and other medical disorders (including major depression, bipolar disorder, post-traumatic stress disorder, alcohol and drug abuse, obesity, migraines, cardiovascular disease, diabetes, etc.) [3]; in case of incorrect information reported to the judicial authority as indicative for abuse, erroneous interpretation of events may generate legal issues in civil, juvenile, family, divorce, and criminal courts [4], [5]. Moreover, child abuse and neglect represent heterogeneous phenomena which widely vary in type, severity, and chronicity resulting in challenging diagnoses [6].

In the scientific literature, a limited number of studies have been conducted about health workers' ability to recognize suspected child abuse. Some studies reported physicians' lack of knowledge in child abuse and neglect. Due to this lack medical doctors may miss sentinel injuries or incorrectly attribute them to accidental trauma [7], [8]. Indeed, the literature data "suggest that many physicians are unable to fulfill the mandate to protect children from abuse and neglect" because of "a lack of education and training about the problem" [9]. However, it is not clear if the reasons of this lack relay on an insufficient preparation of students during medical school and/or a deficiency in continuing medical education during/after fellowships.

For these reasons, the authors of the present manuscript administered a questionnaire to last year medical students in order to: evaluate the degree of knowledge on this thematic in a medical student sample; understand if the abovementioned lack may be due to an insufficient preparation of students during medical school.

2. Material and methods

In order to evaluate medical school knowledge about physical abuse and neglect in paediatric age, a 14-item questionnaire was (anonymously and computer-based) administered to last year medical students. Study population included 179 students. The first 12 questions were focused on child sexual abuse, physical maltreatment, and neglect (Table 1); they consisted of multiple-choice answers (five) but only one was correct. Students' knowledge was considered as sufficient if final score was ≥ 6/12. The thirteenth question was about attendance of paediatric traineeship and/or paediatric exam; thus, it allowed to divide the sample in two Groups: Group A – students who attended paediatric traineeship and/or paediatric exam; Group B - students who did not attend paediatric traineeship and/or paediatric exam. In addition, in order to verify if the attendance of paediatric traineeship and/or paediatric exam (Group A) would have determined better results, for each question chi-square tests were used to evaluate recurrence of statistical differences between answers – divided in binomial categorial variables (correct/incorrect answers) – of the two Groups. In the fourteenth question, students were asked to evaluate themselves, assigning a score (from 1 to 10 points) to their knowledge of child abuse and neglect. Quantitative and statistical analysis were carried out by Excel formulas.

3. Results

Main results are reported in Table 1, Table 2. For the first 12 questions, division of results in binomial categorial variables (correct/incorrect) is summarized in Table 2. The 77.7% scored < 6/12. The

46.1% had already underwent both paediatric exam and traineeship; the 25.8% had only attended the paediatric traineeship; the 7.9% of them had only underwent the paediatric exam (Group A). The 20.2% had underwent none of them (Group B) (Table 2). The 98.8% of all students self-scored his/her knowledge as ≤ 5/10 (Table 3). For each question Table 2 shows results – divided in binomial categorial variables (correct/incorrect answers) – for Group A and Group B. For all questions, results of chi-square tests yielded no statistical differences between the two Groups.

4. Discussion

4.1. Analysis of Questionnaire's results

Results pointed out an overall negative outcome for the most part (77.7%) of the 179 students. In 3/12 questions (#2, #7, and #8), < 10% answered correctly; in other 3/12 questions (#1, #6, and #10), correct answers were above 10% but < 25%. In this population, medical students' awareness of child ano-genital anatomy/pathophysiology appeared particularly deficient. Indeed, a marginal percentage (7.3%) of students was aware for which fundamental physiological aspect adult and preadolescent hymens differ (question #7) [10], [11], [12]. In addition, in question #8 the 55.9% incorrectly answered that rectal prolapse is a manifest sign of chronic anal penetration; the 8.9% answered correctly. The authors are aware that some questions of the proposed survey are based on specialistic literature data about child abuse and neglect [6], [13]. For example, in #6 and #10 questions correct answers are linked to knowledge of the criteria (reported – for example – by Adams and colleagues) about the interpretation of medical findings in suspected child sexual abuse [6], [13]. Nevertheless, high percentages of incorrect answers to #7 and #8 questions suggested basics notions' lack of paediatric ano-genital pathophysiology. Similar considerations can be highlighted considering #2 question's results which demonstrated poor understanding of retinal examination's meaningfulness in paediatric age in case of suspected trauma (abusive or accidental) [14], [15], [16].

In this study, it was not possible to compare the abovementioned results with other literature data due to a lack of similar analyses. Thus, it was not possible to evaluate their concordance/discordance with other authors' indications. However, the authors believe that these results clearly objectivate the need of a systematic implementation of basics in paediatrics because this can allow to easily acquire specialistic notions on child abuse and neglect. These notions would be certainly useful in practical routine as suggested by Ventura et al. who described an interesting case of an unexpected infant death due to undiagnosed biliary atresia. The authors pointed out that the death occurred due to neglect. They also highlighted that "primary care physicians should closely monitor the conditions and development of infants so as to recognize the early warning signs and symptoms of BA, bearing in mind that a timely diagnosis and proper surgical treatment can save the lives of most of these children" [17]. Indeed, the scientific literature suggests that a better knowledge of child abuse and neglect phenomenon among healthcare professionals can guarantee accurate and timely diagnoses. In medical routine, this reduces the number and the seriousness of adverse outcomes which – on the contrary – are more frequent in case of diagnostic delay [18], [19].

In addition, it is important to note that in this field a misdiagnosis can have meaningful implications due to child abuse and neglect negative effects on child development. Many authors described the burden of abused children who may develop neurological and/or psychiatric disorders. The latter can further worsen their long-term outcomes [20]. Thus, due to these medical implications, an in-depth knowledge of child abuse and neglect is imperative.

Moreover, an incomplete, a wrong, or a late diagnosis of a child abuse case can have significant forensic implications because it can cause the loss of meaningful data which cannot be properly used in trials. This can result in a failed/late identification of the perpetrator who can commit other abusive actions on the same child or on other ones. Indeed, in forensic routine only a correct and timely collection of data/proofs allows the proper intervention of the judicial authority.

4.2. Evaluation of statistical data and students' self-awareness

Considering statistical comparison of the two Groups, it can be stated that in this sample nor the study of paediatrics neither the attendance of paediatric traineeships seemed to have had a positive effect on child abuse and neglect knowledge. Indeed, students of Group A did not achieve better results than Group B ones. This demonstrates that the aforementioned deficiencies were not related to students' different levels of progression in medical school training and/or preparation. Also in this case, there were not literature data which allowed to define a proper comparison of these results. No statistical analyses are available about differences in child abuse and neglect knowledge between these two different sub-populations.

In the scientific literature, there are no indications about medical students' awareness of their competence about child abuse and neglect. In the study sample, students' awareness was high. Indeed, the 93.3% scored its knowledge from 1/10 point to 5/10 points. This result perfectly matched with the overall negative outcome. This correspondence testified students' high insight about their lacks. The latter may result in a stronger adhesion to corrective strategies.

4.3. Limitations and perspectives

In these types of studies, the most significant limitation relies on the difficulty to extend the abovementioned considerations to individuals from other geographical regions and/or countries. Indeed, questionnaire's results may differ because of medical schools' distinct organization worldwide. However, comparation of different medical school systems suggests common issues in students' education on child abuse and neglect [21], [22], [23]. This issue has been pointed out by the World Health Organization and the International Association of Medical Regulatory Authorities, highlighting the need for common criteria in medical school accreditation [21], [22], [23]. For example, in the United States (US), even if medical schools' accreditation is obtained through the Liaison Committee on Medical Education (LCME), "the responsibility for curriculum development rests with medical school faculty and is not specifically dictated by accrediting bodies" [24]. In Italy (as in most part of European countries), the accreditation is obtained through specific offices which depend on the Ministry of Instruction and University [21], [22], [23]. However, students' curriculum is developed by directors of medical schools. Thus, as for US, in Italy – and in many European countries [14], [15], [16] – it can be stated that "curricula in child protection varies by leadership, determination, and capacity at each medical school" [24].

Even if geographical differences are reported, epidemiology demonstrates worldwide diffusion of child abuse and neglect phenomena [25], [26], [27]. Considering this scenario in the light of the abovementioned data – which suggest common issues in child abuse and neglect knowledge in medical schools of different geographical areas – possible issues appear particularly meaningful because they can be potentially related to all systems in which mandatory teachings and/or trainings in this field are not provided. Thus, all these systems are at risk to generate students and future medical doctors who "are unable to fulfill the mandate to protect children from abuse and neglect" [24].

Study results and literature data suggested a diffuse need to implement child abuse and neglect knowledge in medical schools. The need to improve professional health workers' training on child abuse has led to creation of specific educational interventions. For example, some manuscript examined the efficacy of a customized online program called iLookOut for Child Abuse (iLookOut), suggesting its usefulness for a widespread educative intervention on child abuse [28], [29]. However – independent of which corrective strategy will be planned – the present study highlighted the necessity for each medical school to define: its current ability to properly train students in child abuse and neglect; students' awareness of their level of expertise. The latter approach should be always implemented because it can allow to specifically understand medical schools' starting level. After this, the authors of the present manuscript suggest that medical schools should apply the following corrective recommendations: a) identification of the specific subjects which should be implemented; b) organization of additional lessons in which medical professionals (experienced in

child abuse and neglect) explain the aforementioned subjects to students; c) planning of school internships in structures/organizations dedicated to the evaluation/diagnosis of child abuse and neglect; d) evaluation of medical students' learning in order to define if further lessons/internships are needed. This approach would improve the knowledge of medical students giving them useful tools for their future professional routine. Moreover, due to the significance of child abuse and neglect effects/outcomes if it is wrongly or belatedly identified, the authors suggest that specific corrective programs about medical student training should be also provided by governments and/or supranational organizations because they can more likely guarantee the uniform application of corrective interventions.

5. Conclusions

The present article pointed out as medical school education can represent a weak point in future medical doctor knowledge on child abuse and neglect. It also allowed to identify as study sample's medical students had high awareness of their lacks in this field. In addition, comparison of medical schools from different geographical areas suggested common issues independent of which accreditation system is implemented. Thus – independent of which corrective strategy will be planned – the present study highlighted the necessity for each medical school to define: its current ability to properly train students in child abuse and neglect; students' awareness of their level of expertise. This can help schools' supervisors to identify the most suitable correctives.

Funding
This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest
The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement
None.

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Table 1. – Summary of questions and answers

Questions	Options (correct answers are in bold style)
1) Which of these fractures is highly specific for physical abuse in non-ambulant children:	a) vertebral body fractures − 2 (1.1%) b) skull linear fractures − 21 (11.7%) c) two or more linear fractures of skull − 59 (33%) **d) posterior rib fractures – 39 (21.8%)** e) collarbone fractures − 58 (32.4%)
2) In case of suspected head trauma (abusive or accidental) in paediatric age, the evaluation of which system (s)/apparatus (es) is particularly meaningful:	a) left external ear – 4 (2.2%)b) inner ears and right nasal cavity – 42 (23.5%) **c) retina, bilaterally – 3 (1.7%)**d) eyes and right inner ear – 105 (58.7%)e) eyes and left external ear – 25 (14%)
3) In paediatric age, skin lesions caused by non-accidental contact with hot fluids are generally characterized by:	a) if lower limbs are involved by forced immersion, skin appears always burned for the entire extension of limbs – 19 (10.6%) **b) there is a clear demarcation between intact skin and damaged skin in case of forced immersion – 80 (44.7%)** c) evident figured skin lesions, from whom the type of fluid can be determined – 6 (3.4%) d) multiple skin lesions which tend to mask previous lesions (abrasions, bruises, etc.) – 52 (29.1%)e) intact skin areas – surrounded by damaged ones – due to accelerated regenerative phenomena – 22 (12.3%)
4) Which of these skin lesions is more likely to be indicative for abusive actions perpetrated by third parties in a walking child:	a) multiple abrasions on the right tibial crest – 6 (3.4%)b) skin bruising on extensor surface of left elbow joint – 35 (19.6%)c) multiple abrasions on both tibial crests – 33 (18.4%) **d) back skin bruising – 84 (46.9%)** e) left eyebrow arch bruising – 21 (11.7%)
5) In case of bone fractures in a non-ambulatory child, a definite diagnosis of osteogenesis imperfecta:	**a) does not inevitably rule out diagnosis of physical maltreatment – 103 (57.5%)**b) does not rule out diagnosis of physical maltreatment only in case of clavicular fracture – 11 (6.1%)c) does not rule out diagnosis of physical maltreatment only in case of skull fracture – 17 (9.5%) d) excludes diagnosis of physical maltreatment for calcium values in blood < 3 mg/dl – 40 (22.3%) d) excludes diagnosis of physical maltreatment for calcium values in blood < 5 mg/dl – 8 (4.5%)

Questions	Options (correct answers are in bold style)
6) In paediatric age, which of these signs is indicative for acute trauma (accidental or inflicted) to external genital tissues:	a) anterior hymenal injury with tissue absence up to the base – 37 (20.7%) b) a defect in the hymen between 1o'clock and 4o'clock that extends to the base of the hymen, with no hymenal tissue discernible at that location – 21 (11.7%) c) a defect in the hymen between 2o'clock and 10o'clock that extends to the base of the hymen, with no hymenal tissue discernible at that location – 30 (16.8%) **d) a defect in the hymen between 4o'clock and 8o'clock that extends to the base of the hymen, with no hymenal tissue discernible at that location – 43 (24%)**e) hymen absence – 48 (26.8%)
7) The hymen in prepubertal age:	a) is generally imperforate, later becoming patent due to estrogenic stimulation – 75 (41.9%) **b) differs from adult one because it is commonly less thick due to low hormonal stimulation – 13 (7.3%)**c) is typically characterized by benign angiomas which disappear in adulthood – 5 (2.8%)d) may be absent in Asiatic children – 12 (6.7%)e) none of the above – 74 (41.3%)
8) The presence of rectal prolapse in paediatric age:	a) is a manifest sign of acute anal penetration – 7 (3.9%)b) is a manifest sign of chronic anal penetration – 100 (55.9%) **c) is not a manifest sign of anal penetration – 16 (8.9%)**d) is a manifest sign of anal penetration if associated with sleep disturbances – 11 (6.1%)e) is a manifest sign of anal penetration if associated with enuresis – 45 (25.1%)
9) Which infection/lesion caused by infective microorganisms is transmitted with higher probability by sexual contact:	**a) Neisseria gonorrheae – 114 (63.7%)** b) Herpes type I or II – 24 (13.4%)c) Lichen sclerosus – 2 (1.1%)d) Genital condyloma acuminatum – 36 (20.1%)e) Molluscum contagiosum – 3 (1.7%)
10) In prepubertal age, which of these anal-genital findings is indicative for trauma (abusive or non-abusive):	a) Hymenal tags – 25 (14%)b) Intravaginal columns – 30 (16.8%) **c) Perianal scar – 42 (23.5%)** d) Vulvar ulcers – 56 (31.3%)e) Perianal skin tags – 26 (14.4%)

Questions	Options (correct answers are in bold style)
11) In accordance with the definition of child abuse and neglect provided by the World Health Organization (WHO, 1999), one of the following conditions can be more likely related to neglective actions perpetrated by parents:	a) child in diabetic ketoacidosis due to a casual and single error in insulin administrations by parents – 12 (6.7%) **b) child in coma due to a protracted forgetfulness of insulin administration by parents – 136 (76%)** c) suspected ingestion of drugs found by the child in a public park – 9 (5%)d) child in a coma condition due to ingestion of drugs administrated by a stranger in a public park – 16 (8.9%)e) none of the above – 6 (3.4%)
12) Which biological fluid/tissue is the most suitable matrix for assessing chronic exposure to drugs in children:	a) saliva – 11 (6.1%) **b) hair – 104 (58.1%)** c) urine – 26 (14.5%)d) blood – 23 (12.8%)e) nail appendages – 15 (8.4%)

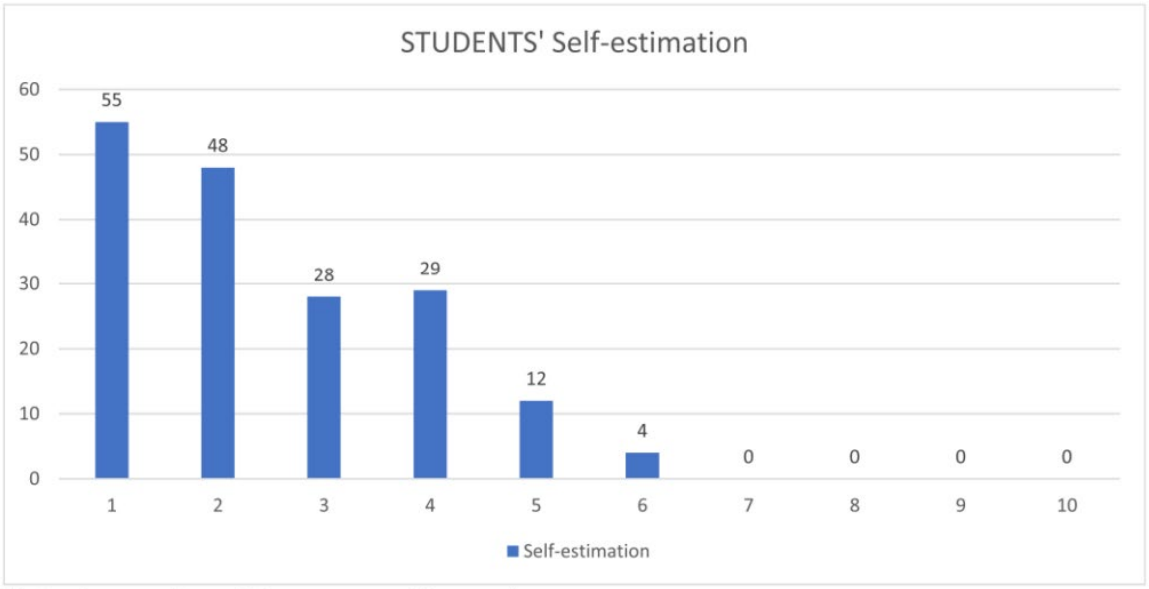
Note: all 179 students answered the first twelve questions.

Table 2. – Correct/Incorrect answers divided for Groups A and B.

	Group A (students who underwent paediatric exam and/or traineeship)		**Group B (students who did not undergo paediatric exam and/or traineeship)**	
Question number	**Correct Answer**	**Incorrect Answer**	**Correct Answer**	**Incorrect Answer**
#1	36 (25.5%)	105 (74.5%)	5 (14%)	32 (86%)
#2	1 (0.71%)	140 (99.29%)	2 (5.4%)	35 (94.6%)
#3	61 (43.3%)	80 (56.7%)	17 (45.9%)	20 (54.1%)
#4	70 (49.6%)	71 (50.4%)	12 (32.4%)	25 (67.6%)
#5	82 (58.1%)	59 (41.9%)	21 (56.8%)	16 (43.2%)
#6	29 (20.6%)	112 (79.4%)	14 (37.8%)	23 (62.2%)
#7	9 (6.4%)	132 (93.6%)	5 (13.5%)	32 (86.5%)
#8	10 (6.8%)	138 (93.2%)	6 (16%)	31 (84%)
#9	95 (67.4%)	46 (32.6%)	18 (48.6%)	19 (51.4%)
#10	36 (25.5%)	105 (74.5%)	9 (24%)	28 (76%)
#11	104 (73.8%)	37 (26.2%)	30 (81%)	7 (19%)
#12	82 (58%)	59 (42%)	20 (54%)	17 (46%)

Note: one student did not answer question about attendance of paediatric exam and/or traineeship; thus her/his results were not considered in this table.

Table 3. – Results of students' self-estimation about their knowledge on child abuse and neglect.



Note: three students did not answer this question

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