Knowledge on Clinical Signs of Child Maltreatment among Childcare Workers: A Survey

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Keywords

Child abuse and neglect; childcare workers; clinical symptoms and signs.

Abstract

Objective

Child maltreatment is a global health concern often underreported, making early detection crucial. Recognizing signs of abuse, especially in childcare settings where attendance rates are high, is pivotal.

Methods

This prospective study using an online survey included 16 hypothetical cases accompanied by a clinical image. Qualtrics was used to distribute the survey. Participation was completely voluntary and anonymous. Childcare workers were asked to give a risk-assessment about the case using a Likert scale.

Results

93 respondents fully completed the questionnaire. The overall mean score on the survey was 67.8% (Std. Deviation 12.0%). In general, the percentage of correct answers on the cases suggestive for child maltreatment (67.8%) and the one not suggestive for child maltreatment (67.9%) were the same. No significant correlation was obtained between the variables 'gender', 'age', 'number of children', 'number of years of work experience' and the outcome 'overall score'. However, there was a positive correlation between previous contact with suspected child maltreatment and an adequate assessment of the situation (p-value 0.005).

Conclusions

The knowledge about physical signs of child maltreatment does not depend on the age or work experience of the childcare worker. However, knowledge could be positively influenced by previous experiences with suspected child maltreatment and additional training on this topic.

Introduction

Child abuse and neglect are global health problems occurring across all communities regardless of social, racial, and economic backgrounds (1-3). These include various types of abuse - physical (22.6%), sexual (12.7%), and emotional (36.3%) - linked to significantly higher levels of psychopathology in affected children. Child maltreatment is widely under-reported, potentially prolonging or exacerbating cases of abuse (5). Children under the age of three, particularly infants under six months, account for 25% of victims, vulnerable due to their inability to defend themselves or articulate the abuse (6, 7).

In the context of physical abuse, skin lesions such as hematomas and ecchymoses are common manifestations, serving as logical sentinels for early detection to prevent future harm (8). Sentinel injuries, visible minor injuries in infants that are poorly explained, are suspicious of physical maltreatment (9). Caregivers should be familiar with injury patterns and distributions in order to appropriately identify child physical abuse (3). Although external signs may be subtle, identifying the pattern and location of any skin finding can help differentiate accidental from abusive injury, facilitating timely referral to clinical experts (10). Any missed diagnosis carries the risk of recurrence and further child maltreatment (12).

With half of European Union children under three attending daycare, Belgium, particularly Flanders, reflects this trend, with 94,681 licensed daycare places in 2021 and 53.4% attendance among infants and toddlers (13, 14). Daycare staff, deeply involved in children's lives, have unique insights into their well-being, potentially surpassing physicians' assessments.

Belgium's 'Confidential Centers for Child Abuse' and helpline '1712' provide avenues for anonymous reporting, receiving 7,535 reports in 2021, 14% concerning children under three years of age (15). However, childcare education in Flanders, while emphasizing reporting guidelines, lacks focus on recognizing physical signs of maltreatment, hindering professionals' ability to accurately identify abuse (16, 17).

Few publications address recognizing abuse in this professional population. A comparative study among preschool teachers revealed inconsistent reporting despite high prevalence, attributed to a lack of knowledge and insufficient evidence of abuse. Developing standardized training programs and guidelines to support teachers is crucial (7). Research indicates that teachers' awareness of child neglect and abuse increases after training, with reporting rates significantly improving (18). Another study found that daycare workers have limited knowledge about reporting procedures and their legal protections (19).

This study aimed to assess childcare workers' familiarity with physical signs of child neglect and abuse in Flanders.

Table 1 : Case scenario description of the survey

	Vignette	Image description
Case 1	Matteo, a 3-month-old boy, has started nursery today for the first time. During the welcome interview, the parents didn't mention anything unusual about the child. They seemed enthusiastic and friendly. Matteo has cried frequently today, which is expected on his first day in a new environment. While changing his diaper, you notice a blue tint on his bottom. He doesn't react when you apply pressure to the spot. When Matteo's mom comes to pick him up, she explains that Matteo has had this since birth.	The clinical image shows the lower back of a newborn infant with several confluent blueish to blue-grey nummular spots, typical of dermal melanosis.
Case 2	Amélie is a cheerful girl who has been attending daycare for 1.5 years. You're familiar with her mother, who picks her up daily, but you've never met her father. Today, Amélie is unusually quiet and uses her left arm sparingly. In the evening, you inquire about her arm, and her mother explains, "She went to the woods with her dad yesterday. They were walking hand in hand, and while trying to jump in puddles, Amélie slipped, but her dad managed to pull her up by the arm." Her mom also noticed yesterday that Amélie's arm was bothering her but decided to wait and see. Now, she is decided they will visit the doctor tonight for sure.	The clinical image shows a child on a hospital stretcher with her left arm stretched out parallel to her side, the right arm is in use.
Case 3	Louis, a 1.5-year-old boy, comes from a family of 6, none of whom have attended this nursery before. Today marks the last day before summer vacation, and Louis' family is leaving for Spain tonight for a 2-week trip. His dad drops him off in the morning in a rush. Later in the day, you notice that Louis' ear appears blue, and he cries when you touch it. When you ask his dad in the evening what happened, he explains, "The older siblings were playing with a plastic jump rope yesterday, and Louis accidentally got hit on the ear with it." Louis' dad works as a nurse in an assisted living facility, and his mom is currently unemployed and dealing with depression. His dad dismisses the blue ear, saying, "Kids grow up with bumps and bruises, especially with boys and brothers."	The clinical image shows the left ear of a child. There is a clear ecchymosis on the antihelical crura and scapha. The rest of the earlobe is normal.
Case 4	The nursery has been closed for collective leave for 2 weeks and reopened today. In the morning, the mother of Fien, a 4-month-old girl, did not mention anything in particular when she dropped her daughter. While changing Fien's diaper later that day, you notice the following image on her bottom. Fien comes from a family of 5. Her parents are very kind, and you are familiar with them because her older sister also attended the nursery. Unfortunately, Fien's family isn't very well-off, and you often notice that Fien wears the same dirty clothes. In the evening, you ask her mom if and when she noticed this redness on Fien's bottom. She replies that she first noticed it yesterday morning before giving Fien a bath.	The clinical image shows the anogenital region of a female infant with a severe erythematous rash with papulovesicular lesions, fissures, and erosions. It is more severe than the 'common' phenotype of a diaper dermatitis.
Case 5	As a new employee in this nursery, you have only known the children for 2 weeks. Today, you notice a bruise on the back of Lola, a 13-month-old girl. When you touch it, she does not react, but it does feel swollen. In the evening, Lola's mom explains that she has had this bruise since she was little. She appreciates your concern for the health of the children in the nursery.	The clinical image shows a circular elevation in the interscapular region of an infant. The skin at the site of the nummular elevation has a pale bluish colour and in the middle there are some small regions of purple colour. It has the aspects of a deep haemangioma.
Case 6	Yentel is a 14-month-old boy who's quite energetic who attends your nursery. Different people, including the parents, grandparents, or an aunt, drop him off and pick him up every day. In the evening, Yentel's mom sends a WhatsApp message stating another child must have bitten Yentel on his arm and sends a picture as evidence. You inquire with your colleagues if they noticed anything, but they didn't observe any incidents. Yentel wore a sweatshirt all day, so you had not noticed these injuries either. You recall that Yentel had a burn on his knee a month ago. There have been some challenges in communicating with the parents, and Yentel has been absent from the nursery more frequently lately when he was expected to attend.	The image shows 2 red circular skin lesions on the left arm consistent with superficial bite injuries.
Case 7	The nursery has been closed for collective leave for 2 weeks and reopened today. In the morning, Ella's father, a, informed you that his daughter - a 3-month-old infant -has had a rash in the diaper region for several days. They took her to the paediatrician, who prescribed a cream. Otherwise, Ella has been declared healthy. The father requests that you apply the cream once during the day as well.	The clinical image shows a bright erythematous rash in the anogenital region of a female infant. The skin folds are involved, and satellite lesions are visible at the edges of the rash, suggestive for a Candida infection.
Case 8	Vic is a 16-month-old boy. He is usually quiet and makes little eye contact when spoken to. When his grandmother drops him off, she mentions that he bumped into the corner of a table yesterday and now has a 'black eye'. You have not seen his parents in a while. Vic's mother has been in the hospital due to alcohol-related issues. You have heard from the father that the couple is going through a divorce.	The clinical image shows a toddler with an orbital ecchymosis of the right eye. The discoloration is most pronounced above the medial commissure. The eyebrow is intact and there is no swelling around the eye.
Case 9	Lars (1.5 years old) was adopted at 3 weeks old. His adoptive parents shared with you during the first meeting that they've faced numerous challenges since then. Lars has been prone to crying for extended periods, and he has also experienced allergies and feeding difficulties. You have had several conversations with his concerned father, who often feels insecure about parenting and sometimes feels overwhelmed with the responsibilities. However, things have been improving lately. Lars is usually very quiet around his parents, but he becomes one of the loudest kids once he's in the nursery. Suddenly, you notice an injury under his ear and ask Lars himself what happened. Lars responds, "daddy." In the evening, his father mentions he had not noticed it yet, and they assume Lars might have "bumped himself" during the day.	The clinical image shows a rectilinear superficial excoriation with a length of 4 cm and a width of 0.3cm behind the lower part of the ear.
Case 10	On Monday morning, Félicia is brought to the nursery by a friend of her mother. Félicia is a 10-month-old girl who cannot yet walk but enjoys crawling. She is a sociable child who actively seeks out interaction with other children. When you tried to pick her up on the playmat, she pulled her leg away and started crying. Nothing out of the ordinary had happened in the nursery that day until then. While changing her diaper, you notice bruises on her legs. When you ask her dad about the bruises, he says he does not know how or when they originated. Félicia was with her mom last week due to co-parenting.	The clinical image shows the lower legs of an infant with several ecchymoses on the anterior side below the knee, two on the left leg and seven on the right leg. The largest has a diameter of 2cm, the smallest 0.5 cm.
Case 11	The parents of Noah, who is 3 months old, express concern about feeding problems. Noah has been experiencing frequent regurgitation of milk, and according to the parents, he appears to have some cramps and often cries in the evening. Today, Noah vomits milk, prompting you to change his clothes. While changing him, you notice red streaks on his right leg. When you inquire about the cause of the rash, the parents explain that they found him this morning with his leg wedged between the bed's pillars.	The clinical image shows both lower legs of an infant with linear reddish lesions in the conformation of a negative imprint of adult digits on the right lower leg.

	Vignette	Image description
Case 12	When Matthies' mother drops him off at the daycare centre in the morning, she informs you that yesterday he had a serious fight with his sister, who bit him. Matthies (23m old) never likes to say goodbye to his mother and always cries when she leaves. However, after a few minutes, he calms down and becomes a happy boy again. When asked who bit him, Matthies says, "sister."	The clinical image shows a toddler with a small and superficial bite wound on the left cheek.
Case 13	When you receive Jesse (1.5 years old) in the nursery in the morning, you are startled by the bump on his forehead. His dad responds with a laugh, explaining that Jesse was too wild while playing yesterday and fell on his head while running with his toys in his hands. They visited the doctor on call, who reassured them that it was just an insignificant bump. Jesse is indeed one of the more energetic kids in the group and always makes a lot of noise while playing.	The clinical image shows a toddler with a small hematoma on the left frontal part of the skull. There are no additional lesions.
Case 14	Simon (16 months) is brought to the nursery by his mom this morning. She is in tears as she explains that Simon returned from his father's house yesterday with a "blue cheek". The parents are currently going through a difficult divorce, and the father is seeking full custody of Simon. Simon always gets excited when he sees someone entering the nursery, but when his parents show up, he often hides away.	The clinical image shows a toddler with a 'slap mark'. One can notice the imprint of a hand (imprint of digits) on the right cheek of the child.
Case 15	Emma's father reports today that Emma burned herself this morning with a hot cup of tea that fell over during breakfast. He immediately held her arm under running cold water and then had it checked by the neighbour, who is a nurse. She has already applied an anti-burn product (Flamigel°) to it. Emma's parents are both very ambitious and work hard, so she spends a lot of time in the nursery.	The clinical image shows an oval-shaped second degree burn on the forearm of a child. The skin is red and there are central regions with desquamation present.
Case 16	Sofie's mother reports today that Sofie has been reluctant to put weight on her right leg since this morning. Yesterday, there did not seem to be any problems, and she was playing normally. However, this morning, she cried when her mom tried to help her walk after changing her clothes. Sofie is 13 months old and can walk with support or while holding an adult's hand. Her mother is puzzled as Sofie has not fallen, does not have a fever, and does not seem to be experiencing pain elsewhere. She has plans to take the afternoon off to bring Sofie to the family doctor. During the morning, you also notice that Sofie experiences pain in her right leg when being lifted or when attempting to walk. You examined her thoroughly but could not find any bruises or other abnormalities. Despite this, Sofie appears happy and does not seem to have any other issues.	The clinical image shows a toddler who is standing up, supported by an adult. The weight of the child is on the left leg, the right leg seems to be less used.

Table 2 : Demographic characteristics of the participants.

	N = 93	%
Gender		
Male	2	2.2
Female	91	97.8
Age	(Years)	
19-35 years	35	37.6
36-50 years	31	33.3
>50 years	22	23.7
Missing data	5	5.4
Number of children	(Children)	
0	30	32.3
1	13	14.0
2	34	36.6
3	13	14.0
4	1	1.1
>4	2	2.2
Number of years of work experience	(Years)	
1-5 years	24	26.9
6-10 years	15	16.1
11-25 years	40	43.0
>25 years	13	14.0
Been in contact with suspected child maltreatment		
Yes	34	36.6
No	59	63.4
Total	93	100
	Mean score (years)	Standard error
Age	40.2	11.50

Methods

Study Design

This prospective study, using an online survey, received approval from the Research Ethics Committee UZ/KU Leuven (MP023079). The study protocol mirrored a previous research methodology from our group but targeted a different audience (1). An anonymous online survey featuring hypothetical cases with clinical images was used. Participation in the questionnaire was voluntary and contingent upon informed consent. The study design comprised two components: a sociodemographic questionnaire gathering data on gender, age, number of children, years of work experience, and contact with suspected child maltreatment, alongside 16 clinical cases. These hypothetical cases, set within a childcare context, constituted the primary questionnaire content. Each case, depicting potential child maltreatment, was accompanied by a clinical image illustrating the child's signs or injuries (Table 1). Childcare workers evaluated the risk level of each case for child abuse and neglect using a Likert scale ("unsuspicious," "rather not suspicious," "neutral," "rather suspicious," "highly suspicious"). The survey was distributed via Qualtrics, validated by both expert and layperson groups to ensure internal validity and comprehension. Data collection took place from March to June 2023.

Statistical Analysis

Only fully completed questionnaires obtained via Qualtrics were analyzed. IBM SPSS software facilitated all statistical analyses. Categorical variables were presented as frequencies and percentages. Responses were dichotomized for analysis: "unsuspicious" and "rather not suspicious" categorized as "not suspicious," while "rather suspicious" and "highly suspicious" were considered "suspicious," with "neutral" always deemed incorrect. Pediatric experts evaluated each case based on practical experience and medical literature. The scoring of the experts was used to dichotomize the participant's answers into correct or incorrect. Participants' responses were graded accordingly, and an overall score reflecting the ability to distinguish cases indicative of child maltreatment was calculated for each participant. The proportion of correct answers for each case was visualized using a Likert plot. The Chi-Squared test determined statistical correlations between

Figure 1A : Overall score on the survey of 16 cases (N=93).

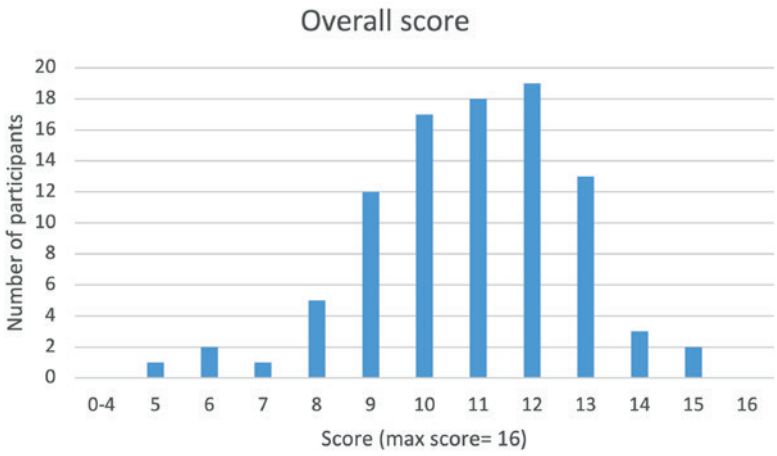

Figure 1B : Boxplot of the overall score on the survey and the two subgroups.

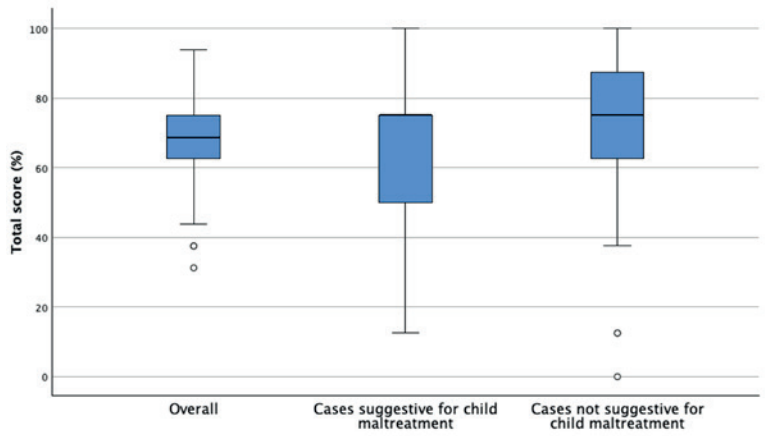

Table 3 : The proportion of correct answers per case.

Case	Subject	Correct answers %
Case 1	Congenital dermal melanocytosis	46.2%
Case 2	Pulled elbow	54.8%
Case 3	Bruise on ear	41.9%
Case 4	Diaper rash	60.2%
Case 5	Hemangioma	31.2%
Case 6	Bite trauma	84.9%
Case 7	Infection diaper region	88.2%
Case 8	Orbital hematoma	78.5%
Case 9	Skin injury behind ear	74.2%
Case 10	Bruises on lower leg	54.8%
Case 11	Pinch wound	48.4%
Case 12	Bite trauma	92.5%
Case 13	Forehead hematoma	89.2%
Case 14	Slap injury	98.9%
Case 15	Burn	55.9%
Case 16	Dysfunctional leg	84.9%

variables (gender, age, number of children, years of work experience, and contact with suspected child maltreatment) and the overall score, with a significance level set at 0.05.

Results

Participants

The survey included childcare workers from various daycare centers in Flanders, Belgium. The total number of invited daycare workers remains unknown as invitations were distributed by daycare authorities. Ninety-three respondents completed the questionnaire in full. Participant characteristics are summarized in Table 2. Most participants were women (97.8%) and had at least one child (67.7%). The mean age was 40.2 years (range 19-60 years), with 57% having over 10 years of daycare work experience. Additionally, 36.6% of respondents reported encountering a suspected abuse case.

Overall Score

The survey's overall mean score was 67.8% (Standard Deviation 12.0%) compared to the correction key. Figure 1A presents a histogram illustrating the total scores of all individuals (N=93). The lowest score, 31.3%, was achieved by one respondent who correctly interpreted only 5 of 16 cases, while the highest score, 93.8%, was attained by two respondents (15 of 16 cases answered correctly). Figure 1B displays a boxplot depicting the sensitivity and specificity of detecting child maltreatment, with sensitivity representing the total score on cases suggestive of maltreatment and specificity representing the total score on cases not suggestive of maltreatment.

Furthermore, the proportion of correct responses per case is detailed in Table 3, with a Likert plot visualization in Figure 2A and 2B.

The best-solved case suggestive of maltreatment involved facial linear-shaped hematomas suspected of resulting from a hand slap, with 98.9% correct responses. Conversely, the case concerning a bruise on the ear had the lowest correct response rate (41.9%). Among cases not suggestive of maltreatment, the case involving a bite mark on the face had the highest correct response rate (92.5%), while only 31.2% answered correctly for the case involving a hemangioma. Overall, the percentage of correct answers for cases suggestive and not suggestive of maltreatment was similar, both around 67.8%.

Relationship Between Participant Characteristics and Overall Score

Simple linear regression analysis for age, number of children, years of work experience, and previous contact with suspected maltreatment revealed correlation coefficients (R) of 0.026, 0.130, 0.026, and 0.305, respectively, with coefficients of determination (R^2) of 0.001, 0.017, 0.001, and 0.093, respectively. Only previous contact with suspected maltreatment showed a low positive correlation with the outcome, while correlations for other variables were negligible.

Multiple regression analysis incorporating age, gender, number of children, years of work experience, and previous contact with suspected maltreatment yielded an adjusted R^2 of 0.073, indicating a low predictive value for this model.

Univariate quadratic regression (Table 4) showed a statistically significant estimate parameter of 0.307 for the variable 'contact with suspected child maltreatment' (P-value 0.005), suggesting that individuals who encountered suspected child maltreatment had greater knowledge in recognizing physical injury due to maltreatment.

Figure 2A : Cases suggestive for child maltreatment: ranked from best (upper) to least well (bottom) solved.

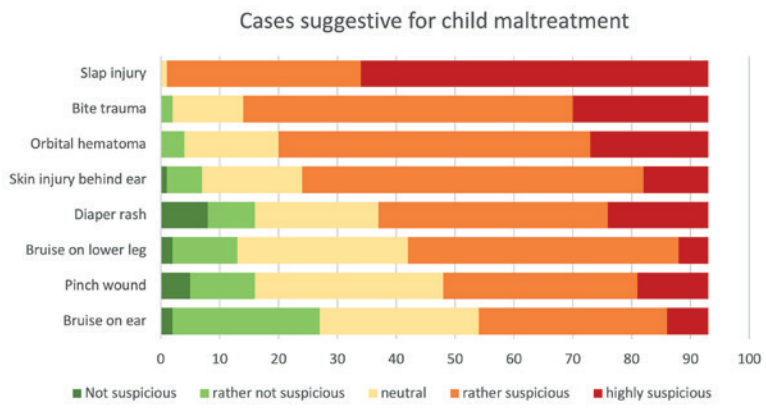

Figure 2B : Cases not suggestive for child maltreatment: ranked from best (upper) to least well (bottom) solved.

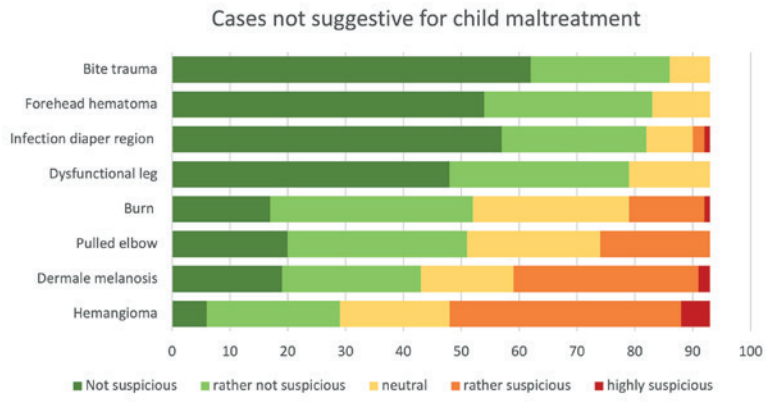

Table 4 : Relationship between participant characteristics and overall score.

	Univariate Quadratic regression		
Variable	**Estimate (Standardized coefficients beta)**	**P-value**	**95.0% Confidence interval**
Gender			
Female	0.006	0.954	-17.190;18.228
Male*	-	-	-
Age	-0.171	0.288	-0.521;0.157
Number of children	0.210	0.100	-0.409;4.563
Years of work experience	0.002	0.987	-3.544;3.602
Contact with child maltreatment	0.307	0.005	2.430;13.130

* Male as reference.

Discussion

In this study a relevant sample of Flemish daycare workers showed a good appreciation of physical signs of child abuse and neglect.

Out of 93 participants, only 2 respondents were men (2.1%). Due to this low number, the influence of gender on the overall score could not be analyzed. Notably, data on the proportion of men employed in childcare are scarce, but the average proportion in Belgium in 2023 was 1.7% (data supplied by Opgroeien, Flemish Government), aligning with our sample. The average number of children per participant in this study was 2.44 (SD 1.23), notably higher than the average fertility rate in Flanders of 1.53 (data from 2022) (20). This suggests that women working in childcare centers may tend to have more children on average. Additionally, 36.6% of respondents reported prior contact with a suspected case of child abuse.

The average score on the survey was 67.8%, with 89 out of 93 participants scoring at least 8 out of 16 cases correctly. However, there is no established threshold for determining a good result. Interestingly, the proportion of incorrectly assessed cases 'suggestive' and 'not suggestive' of child maltreatment was similar (32.2% and 32.1%, respectively), suggesting equal sensitivity and specificity in detecting maltreatment. This contrasts with a previous study among physicians in training, where cases suggestive of maltreatment were solved better than non-suggestive cases (85.7% [IQR 28.6%] versus 62.5% [IQR 25.0%], $p < 0.001$) (1). While the mean score on suggestive and non-suggestive cases is the same, the boxplot (Figure 1B) reveals that people are more accurate in assessing non-suggestive cases, possibly due to outliers pulling down the mean score for suggestive cases. There is a wider spread of responses within suggestive cases, indicating that childcare workers may struggle more with recognizing typical physical injuries.

Within non-suggestive cases, 68.8% and 55.8% would misjudge a hemangioma and a congenital dermal melanocytosis, respectively, as child maltreatment. These false positives can strain the relationship between parents and childcare workers. Conversely, within cases suspected of maltreatment, 58.1% and 51.6% would consider a bruise on the ear and a pinch wound, respectively, as non-alarming. Overall, the context in which a child presents with a skin injury and the story told by the parents play an enormous role in physical maltreatment cases. Approximately one-third of cases were not interpreted correctly. Additional training on recognizing "mimickers" for child maltreatment may improve results, preventing trauma and false accusations of parents.

We examined if participant's age, number of children, years of work experience, and prior contact with suspected maltreatment could correlate with a higher overall score. However, only previous contact with maltreatment showed statistical significance in relation to the overall score. As age and work experience are not predictors of outcome, we can infer that working in childcare does not inherently increase knowledge, but external education may. Previous studies support this notion, indicating that participants who received formal training displayed significantly higher overall knowledge of recognizing and reporting child abuse and neglect, along with a wider range of individual knowledge items (1,22). A train-the-trainer program promoting knowledge of warning signs of child maltreatment in childcare settings could be an effective strategy, enhancing childcare workers' competence in interventions (23). This approach allows many practitioners to receive relevant information in a short period.

Limitations

The study's invitation was sent to large child daycare centers (with more than 20 children), potentially introducing selection bias, limiting the extrapolation of results to smaller centers. Due to the small sample

size, no subpopulations were defined. The use of written cases in the survey may make judgment more challenging for participants compared to real-life scenarios, where the connection between the childcare worker and the child's family can aid assessment. The scenarios have all been scored by experts, whose answers were not fully identical as the cases were deliberately not designed to be 'black and white'. However all experts scored the cases in the same direction (either suspicious or not suspicious).

Conclusion

This study is exploratory research that can guide future work in this field. In order to improve overall detection, investments in formal training are necessary since work experience and age are not related to a better detection of child abuse and neglect by the staff in daycare.

The authors have no conflicts of interest to declare with regard to the topic discussed in this manuscript.

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