

BRIEF REPORT OPEN ACCESS

Validation of the SCOFF as a Simple Screening Tool for Eating Disorders in an Inpatient Sample Before and During COVID-19

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ABSTRACT

Objective: Eating disorders (EDs) represent a significant public health concern, with a high prevalence among adolescent girls. The COVID-19 pandemic has led to a marked increase in EDs, underlining the need for a brief screening tool in clinical settings. The present study compared ICD-10-based ED-diagnoses with SCOFF-identified at-risk female patients in a clinical setting and assessed the tool's reliability.

Method: Routine data ($n = 955$ participants) from a child and adolescent psychiatric hospital were evaluated regarding the incidence of ED-diagnoses before ($n = 312$) and during the pandemic ($n = 643$) and compared with SCOFF results. The SCOFF's sensitivity and specificity were examined.

Results: ED-diagnoses significantly increased, almost doubling from before to during the pandemic. The number of at-risk patients identified by the SCOFF likewise differed between the two time points. The SCOFF showed high sensitivity at cut-offs of 2 (pre-pandemic) and 3 (peri-pandemic) but low specificity. Internal consistency was poor.

Discussion: The findings align with previous research indicating an elevated rate of admission to clinical care for ED-diagnoses during the pandemic, a trend also reflected in the SCOFF results. However, the SCOFF's low specificity and poor internal consistency raise concerns about its applicability among adolescent psychiatric inpatients.

1 | Introduction

Eating disorders (EDs) are among the most common chronic health problems affecting children and adolescents, with the highest prevalence in adolescent girls (Herpertz-Dahlmann, Dimpfle, and Eckardt 2022; Napp et al. 2023; Taquet et al. 2021). As EDs often remain undetected in healthcare settings, especially among adolescent psychiatric inpatients (Pehlivanurk-Kizilkan,

Campbell, and White Zappitelli 2024) brief instruments to facilitate diagnostic assessment in clinical settings are needed, particularly given the markedly increased ED incidence rates reported during the COVID-19 pandemic (Herpertz-Dahlmann, Dimpfle, and Eckardt 2022). The briefest screening tool to date is the five-item SCOFF questionnaire, which has been used in several studies and settings to identify youth at risk of EDs (Coop et al. 2024). However, the SCOFF has been criticized due to high variability

Clara Sophie Beer and Luisa Marie Lüken contributed equally to this study.

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Summary

- This study compared ICD-10 based ED diagnoses with SCOFF-identified at-risk inpatient females pre- and peri-COVID-19 pandemic.
- SCOFF's sensitivity and specificity were evaluated.
- ED diagnoses doubled as a result of the COVID-19 pandemic.
- SCOFF's internal consistency was low and not adequate for clinical samples.
- Clinicians need more reliable tools to identify eating disorders earlier and more accurately.

in terms of sensitivity (25%–79%) and specificity (74%–97%) (Kutz et al. 2020; Richter et al. 2017). Recently, this has been attributed to the misuse of this scale, which was not designed as a diagnostic tool or to quantify ED symptoms (Coop et al. 2024). Interestingly, no study to date has examined the SCOFF as a screener in an inpatient population.

Hence, the present study investigated the appropriateness of the SCOFF to assess ED risk in an inpatient setting. Based on the existing evidence, we expected the SCOFF to demonstrate acceptable reliability and high sensitivity and specificity at a cut-off score of 2 (Lichtenstein, Hemmingsen, and Støving 2017). Due to the rise of ED diagnoses and aggravated symptoms during the pandemic, we used clinical data from both pre-pandemic (PREP) and peri-pandemic (PERIP). We hypothesized an increase in patients presenting with EDs from pre- to peri-pandemic and investigated whether this would also be reflected in more patients exceeding the cut-off of 2 on the SCOFF.

2 | Method

2.1 | Procedures and Design

Data were collected from patients admitted to a large hospital for child and adolescent psychiatry between 01/2019 and 12/2022, as part of the standard routine diagnostic assessment within 2 weeks after admission. The study was approved by the responsible Ethics Committee (registration no. 4359-12). Informed consent of legal guardians or patients is not required for anonymized clinical routine data analysis (Art. 9 (2) (j) GDPR; §5 (5), §6 and §17 DSG NRW). Patients and their legal guardians were informed that the anonymized data may be used for research purposes.¹

2.2 | Sample

Data from $n=955$ female patients were eligible for the study (see Figure 1 for inclusion and exclusion criteria). To examine the influence of the COVID-19 pandemic, we created two data sets reflecting typical inpatient samples for the time periods before (PREP) and during (PERIP) the pandemic. The PREP group ($n=312$) comprised patients treated between 01/2019 and 03/2020 (close to the start of the first lockdown in Germany) while the PERIP group ($n=643$) comprised patients treated between 03/2020 and 12/2022 (for demographic information, see Table S1).

The main clinical diagnoses² in the total sample were distributed as follows: 62.3% of patients were diagnosed with a depressive disorder, 4.6% with an anxiety disorder, 20% with an externalizing disorder, 3.9% with other diagnoses (e.g., PTSD), and 9.2% ($n=88$) with an ED (this number refers to primary or secondary diagnoses; see Figure S1 and Table S2).

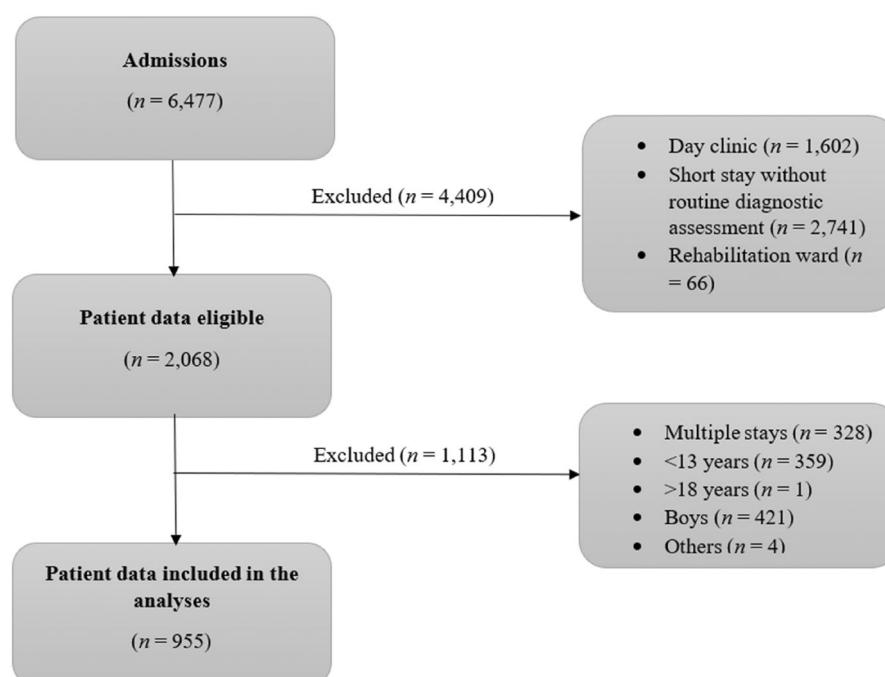


FIGURE 1 | CONSORT Flow Diagram. For patients who completed the SCOFF more than once due to multiple hospital admissions, only data from the first time point were considered in order to avoid biases. Patients aged under 13 or over 18 years were excluded, as these age groups received different questionnaires during routine assessment. Nonfemale patients were excluded ($n=424$). One patient with an invalid diagnostic code was excluded.

2.3 | Measurements

Patients completed the German translation (Richter et al. 2017) of the SCOFF (Morgan, Reid, and Lacey 1999), which comprises five dichotomously answered questions covering the domains Sick, Control, One Stone (of lost weight), Fat, and Food (see [Supporting Information: Supplement 4](#)). The original validation study established a sensitivity of 100% (96.9%–100%), a specificity of 87.5% (79.2%–93.4%), and a cut-off of two affirmed items to identify risk of a clinically relevant ED diagnosis. Additionally, patients completed self-report questionnaires for depressive and anxiety symptoms (see [Supporting information: Supplement 5 and Table S3](#)).

2.4 | Statistical Analyses

Statistical analyses were performed using IBM SPSS Statistics version 29 with significance set at $p < 0.05$ (two-tailed). We used t - and χ^2 tests to explore differences between the PREP and PERIP groups regarding (1) incidence of ED diagnoses, (2) number of participants exceeding the SCOFF cut-off of 2 (ED risk), and (3) SCOFF items answered with “yes.” Correlations were calculated between patients’ age and ED diagnosis as well as SCOFF score. We analyzed the psychometric properties of the SCOFF in each subgroup separately. For internal consistency, we report Cronbach’s alpha and McDonald’s omega, calculated using the OMEGA macro for SPSS (Hayes and Coutts 2020). Sensitivity and specificity were calculated for all cut-off points regarding clinical ED diagnoses to assess validity. ROC curves were plotted and AUC was calculated as an indicator of discriminative ability. To identify the optimal threshold, we calculated the Youden index for the different cut-offs.

3 | Results

3.1 | Preliminary Analyses

The two groups were comparable regarding age ($M_{\text{PREP}} = 15.21$; $SD = 1.38$; $M_{\text{PERIP}} = 15.18$; $SD = 1.41$; $t(953) = 0.26$, $p = 0.798$, Cohen’s $d = 0.02$, 95% CI $[-1.2, 0.15]$) and BMI age percentile ($M_{\text{PREP}} = 63.68$; $SD = 30.10$; $M_{\text{PERIP}} = 59.46$; $SD = 33.84$; $t(953) = 1.87$, $p = 0.062$, Cohen’s $d = 0.13$, 95% CI $[-0.01, 0.26]$). The PREP group had an overall higher educational level (see [Supporting Information: Supplement 1](#)) and a significantly higher average number of comorbid ICD-10 psychiatric diagnoses ($M_{\text{PREP}} = 1.03$; $SD = 1.09$) than the PERIP group ($M_{\text{PERIP}} = 0.84$; $SD = 1.04$; $t(953) = 2.56$, $p = 0.010$, Cohen’s $d = 0.18$, 95% CI $[0.04, 0.32]$). In both groups, age was not significantly associated with the presence of an ED diagnosis ($r_s < 0.08$, $p_s > 0.150$) or the SCOFF score ($r_s < 0.03$, $p_s > 0.526$).

3.2 | Pre- and Peri-Pandemic Incidence of EDs

Before the pandemic, 5.1% ($n = 16$) of participants had a clinical ED diagnosis, compared to 12.6% during the pandemic ($\chi^2(1, n = 88) = 9.25$, $p = 0.002$, $\phi = 0.10$). The incidence of at-risk ED cases based on the SCOFF likewise differed significantly between the groups ($\chi^2(1, n = 88) = 5.00$, $p = 0.025$, $\phi = 0.07$). Approximately 55.4% of the PREP group were considered at

risk based on a cut-off ≥ 2 , compared to 63.0% of the PERIP group ($n_{\text{PREP}} = 173$, $n_{\text{PERIP}} = 405$). Accordingly, the mean number of “yes” answers was significantly higher in the PERIP group ($M_{\text{PREP}} = 1.85$, $SD_{\text{PREP}} = 1.33$; $M_{\text{PERIP}} = 2.10$, $SD_{\text{PERIP}} = 1.42$; $t(953) = -2.54$, $p = 0.001$, Cohen’s $d = -0.18$, 95% CI $[-0.31, -0.04]$). Patients in both groups most frequently affirmed items 2, 4, and 5 (see Table S4).

3.3 | Psychometric Properties of the SCOFF

Internal consistency of the SCOFF was $\alpha = 0.47$ (95% CI $[0.37, 0.56]$; $\omega = 0.49$, 95% CI $[0.33, 0.55]$) and $\alpha = 0.54$ (95% CI $[0.48, 0.59]$; $\omega = 0.53$, 95% CI $[0.46, 0.59]$) for the PREP and PERIP group, respectively. The ROC plots (see Figure 2) revealed acceptable discriminative ability (AUCs = 0.73), with a cut-off of 2 (sensitivity: 87.5%; specificity: 46.3%) as the best trade-off for the PREP group and a cut-off of 3 (sensitivity: 73.6%; specificity: 63.2%) for the PERIP group. In the PREP group, the SCOFF correctly identified 7 of 9 (77.78%) diagnosed AN cases, all 3 BN cases, and all 4 other eating disorder (OED) cases with a cut-off of 2. In the PERIP group, the SCOFF correctly identified 25 of 34 (73.53%) AN cases, both BN cases, and 4 of 6 (66.67%) OED cases with a cut-off of 3 (see Table S5).

4 | Discussion

The incidence of clinician-based ED diagnoses nearly doubled during the pandemic, as also reflected in increased at-risk cases identified by the SCOFF ($\phi = 0.07$). However, specificity, sensitivity, and internal consistency of the SCOFF were not satisfactory at either time point. Hence, the SCOFF appears unsuitable for use in clinical settings when compared to its performance in community samples.

Our findings are consistent with previous research in clinical settings, revealing an increased need for treatment of ED patients and more individuals affected by EDs during the COVID-19 pandemic compared with before (Haripersad et al. 2021; Herpertz-Dahlmann, Dimpfle, and Eckardt 2022; Lin et al. 2021). Only one study reported a decrease in ED symptoms and fewer at-risk cases assessed using the SCOFF in a population-based sample

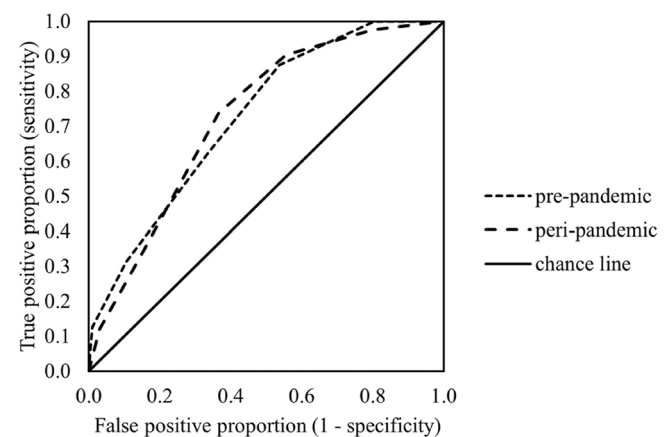


FIGURE 2 | Receiver operating characteristic (ROC) curve of the SCOFF before and during COVID-19.

of children and adolescents during the pandemic. This conflicting finding may be due to the differences in setting and sample selection.

In line with the high variability in terms of the sensitivity and specificity of the SCOFF reported in previous studies (Kutz et al. 2020; Richter et al. 2017), this study demonstrated high sensitivity in the pre-pandemic period at a cut-off of 2, and low specificity. Despite the low specificity, the pre-pandemic results indicate that the cut-off of 2 (Lähteenmäki et al. 2009; Sanchez-Armass et al. 2017) should be maintained. Differences between the groups emerged in the peri-pandemic period, with the cut-off shifting to 3, which may be attributable to the fact that adolescents with EDs experienced more severe symptoms during the pandemic, possibly due to the lockdown-related contact and leisure restrictions. However, the AUC value of the ROC analysis indicates a moderate capacity (0.73) of the SCOFF to differentiate between at-risk and not-at-risk patients, irrespective of time point. Given the negligible correlation between age and EDs/ED symptoms indicated by the SCOFF, this is presumably a consequence of the limited variance in age, with most patients aged between 14 and 16. As we did not include a healthy control group, the results can only be interpreted to a certain extent. Moreover, patients with EDs were unequally distributed across the groups. Baseline differences between the groups might have influenced the observed changes, rendering it challenging to ascertain the precise impact of the pandemic on EDs. The low specificity of the SCOFF may be explained by the questionnaire's original purpose (Morgan, Reid, and Lacey 1999). Our sample comprised severely ill patients, and when coupled with common ED symptoms found in other mental disorders, the questionnaire may struggle to differentiate between individuals with and without a genuine ED (Stice et al. 2000). Furthermore, in line with Napp et al. (2023), the internal consistency of the questionnaire in our sample was very low. However, it should be noted that EDs are not a monolithic concept. The SCOFF was not designed as a unidimensional measure, but is rather a screener covering a range of disparate domains. Therefore, reliability should not be considered a primary criterion for evaluation. Together with the finding that all cut-offs showed low positive predictive values regardless of time point, the usefulness of the SCOFF as an early detection screener in clinical populations appears limited.

The strengths of this naturalistic study include the large number of patients and the use of ICD-10-based diagnoses by experienced clinicians, although the exclusive reliance on ICD-10 diagnoses also represents a limitation. Differentiated diagnoses using a structured clinical interview would have enhanced the standardization, validity, and reliability of the diagnostic procedure. Moreover, the ICD-10 does not include binge eating disorder (BED), which is as common as AN and BN in children and adolescents (Kjeldbjerg and Clausen 2023). Hence, BED might be underdiagnosed in our sample, representing a notable limitation. While one might assume a relevant number of individuals reporting binge eating or EDs on a subclinical level, it is unlikely that over half of the clinic's patients would have clinically relevant EDs, as implied by the SCOFF cut-off of 2.

To improve the early detection of EDs in clinical settings, it is therefore crucial to integrate a valid screening tool that

accurately captures core ED symptoms, especially given the possible undetected subclinical EDs that might precede full-blown disorders. For generalized conclusions, further research is also required in male children and adolescents with ED diagnoses.

Author Contributions

Clara Sophie Beer: data curation, formal analysis, writing – original draft, writing – review and editing. **Luisa Marie Lükken:** data curation, formal analysis, writing – original draft, writing – review and editing. **Jessica Eggendorf:** formal analysis, methodology, writing – original draft, writing – review and editing. **Martin Holtmann:** supervision. **Tanja Legenbauer:** conceptualization, supervision, writing – original draft, writing – review and editing.

Disclosure

This study assessed the suitability of the SCOFF as a screening tool for identifying suspected eating disorders in female children and adolescents in a clinical setting, considering the impact of the COVID-19 pandemic on eating disorder symptoms. Given the severe consequences and high mortality rate associated with eating disorders, accurate tools are essential for early detection and intervention, and the SCOFF fails in this regard.

Acknowledgment

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Data Availability Statement

The data that support the findings of this study are available from the research department of the LWL University Hamm, upon reasonable request. The data are not publicly available due to data privacy reasons, but are accessible to qualified researchers who meet the criteria for access to confidential data. For inquiries regarding access to the data, please contact Tanja Legenbauer at tanja.legenbauer@lwl.org.

Endnotes

¹ An information sheet was given at treatment admission.

² Clinical diagnoses were based on the International Classification of Diseases, 10th Revision (ICD-10), as is standard in the German health-care system. As this study employed a naturalistic approach, ICD-10-based clinical diagnoses were applied accordingly.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.