

Primary health care nurses' knowledge, attitudes, and self-reported first-aid preparedness regarding opioid overdose in Egypt: a cross-sectional study

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Abstract

Background

Primary health care nurses may encounter patients at risk of opioid overdose, yet evidence regarding their preparedness in low- and middle-income settings is limited. This study assessed nurses' knowledge, attitudes, and self-reported first-aid preparedness regarding opioid overdose and examined factors associated with preparedness.

Methods

A multicenter cross-sectional study was conducted among 131 nurses working in seven primary health care centers in Tanta City, El-Gharbia Governorate, Egypt. Participants completed the 45-item Opioid Overdose Knowledge Scale, the 28-item Opioid Overdose Attitudes Scale, and a 16-item self-reported first-aid preparedness questionnaire. Data were summarized descriptively, associations were examined using Spearman rank correlations, and factors associated with preparedness were assessed using negative binomial regression.

Results

The mean knowledge score was 9.01 ± 7.01 out of 45, and all participants scored below the prespecified 60% knowledge threshold. The mean preparedness score was 1.79 ± 3.29 out of 16; 123 nurses (93.9%) had low preparedness and 8 (6.1%) had high preparedness. The mean attitude score was 104.19 ± 8.51 ; 66 nurses (50.4%) were classified as neutral and 65 (49.6%) as positive. Attitude was positively correlated with preparedness (Spearman $\rho = 0.565$, $p < 0.001$), whereas knowledge was not ($\rho = -0.147$, $p = 0.094$). In the adjusted analysis, rural residence (IRR = 0.063, 95% CI 0.019–0.213, $p < 0.001$) and higher educational-level category (IRR = 0.298, 95% CI 0.121–0.733, $p = 0.008$) were associated with lower preparedness scores; knowledge and attitude were not independently associated with preparedness.

Conclusions

Marked deficits in opioid-overdose knowledge and self-reported first-aid preparedness were identified, particularly in naloxone use, emergency response, and post-rescue care. Primary care organizations should implement standardized, simulation-based overdose-response education that combines technical knowledge, practical skills, confidence building, and stigma reduction.

Background

Opioid overdose is a preventable medical emergency characterized principally by depressed consciousness and respiratory compromise. The World Health Organization estimated that

approximately 125,000 people died from opioid overdose in 2019 and emphasizes that timely basic life support and naloxone administration can prevent death [1].

Although the epidemiology of opioid-related harm varies by region, the burden of opioid use disorder in the Middle East and North Africa has become increasingly visible [2]. In Egypt, tramadol dependence and acute opioid toxicity have been documented in clinical settings [3, 4]. Comparable concerns regarding tramadol misuse have also been reported in other African countries, including Ghana and Nigeria [5, 6]. These patterns underline the need for frontline health professionals to recognize overdose rapidly and initiate evidence-based first aid.

Primary health care services are often the first point of contact for individuals who use opioids, receive opioid prescriptions, or experience substance-related complications [7]. Nurses working in these settings may contribute to risk assessment, patient and family education, recognition of overdose, activation of emergency medical services, airway support, assisted ventilation, naloxone administration where authorized and available, and post-resuscitation monitoring [8].

Preparedness for these tasks depends not only on factual knowledge but also on confidence, perceived professional responsibility, stigma, and readiness to intervene. The Opioid Overdose Knowledge Scale (OOKS) and Opioid Overdose Attitudes Scale (OOAS) were developed to assess these domains and have been used in overdose-education research [10]. Existing studies have identified gaps in health professionals' knowledge and confidence, as well as concerns and stigmatizing attitudes that may impede timely intervention [11–15]. Evidence from primary health care nurses in Egypt remains limited.

This study therefore aimed to assess opioid-overdose knowledge, attitudes, and self-reported first-aid preparedness among nurses working in primary health care centers in Tanta, Egypt, and to identify factors statistically associated with preparedness.

Methods

Study design and reporting

A multicenter, descriptive-correlational cross-sectional study was conducted. The manuscript was prepared in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations [9].

Setting

The study was conducted at all seven primary health care centers affiliated with the Ministry of Health and Population in Tanta City, El-Gharbia Governorate, Egypt. The centers provide preventive, curative, maternal and child health, vaccination, health-promotion, and referral services to their local communities. The participating centers were Tanta Awal Center (El-Shrouk), Tanta Tanie Center (El-

Embaby), Tanta Thalith Center (El-Azharia), Tanta Rabae Center (Kohafa), Tanta Khames Center (El-Agizy), Dr. Mohamed Mashaly Center, and Siger Center.

Participants and recruitment

Eligible participants were registered nurses employed at one of the participating primary health care centers, involved in direct patient care during the data-collection period, holding a valid professional license, and willing to participate. Nurses who were not providing direct patient care or who submitted incomplete questionnaires were excluded.

A convenience sampling approach was used. A total of 150 eligible nurses were invited to participate through an online survey. Twelve declined and seven submitted incomplete questionnaires; 131 participants were included in the final analysis, corresponding to a response rate of 87.3% (Fig. 1).

Figure 1. Participant recruitment and inclusion in the final analysis.

Figure 1 is supplied as a separate high-resolution PNG file.

Sample-size calculation

An a priori power analysis was performed using G*Power version 3.1.9.7 for a model with seven candidate predictors, assuming a medium effect size ($f^2 = 0.15$), a two-sided α level of 0.05, and 80% power. The minimum required sample size was 103 participants. The recruitment target was increased to 150 to allow for non-response and incomplete questionnaires; the final analytic sample of 131 exceeded the calculated minimum.

Data-collection instruments

Sociodemographic questionnaire

The questionnaire recorded age, sex, marital status, educational level, perceived family-income adequacy, place of residence, and years of nursing experience.

Opioid Overdose Knowledge Scale

The 45-item OOKS developed by Williams et al. [10] was used to assess knowledge of overdose risks, signs, appropriate actions, and naloxone use. Correct responses received one point, and incorrect or 'do not know' responses received zero points, producing a total score of 0–45. Scores were classified as low ($< 60\%$; 0–26), moderate (60–79%; 27–35), or high ($\geq 80\%$; 36–45). In the current analytic sample, internal consistency was high (Cronbach's $\alpha = 0.873$).

Opioid Overdose Attitudes Scale

The 28-item OOAS developed by Williams et al. [10] was used to assess competence/confidence, concerns about overdose intervention, and readiness to intervene. Items were rated on a 5-point scale from 1 to 5. Items 1, 2, 7, 8, 9, 12, 14, 17, 20, 21, 22, 25, 26, and 28 were reverse-scored so that higher values consistently represented more favorable attitudes. Item scores were summed to produce a total score ranging from 28 to 140. Researcher-defined categories were negative (28–69), neutral (70–104), and positive (105–140). Internal consistency in the study sample was acceptable (Cronbach's $\alpha = 0.747$).

Self-reported first-aid preparedness questionnaire

A 16-item questionnaire was developed for this study using WHO guidance on community management of opioid overdose [8]. Items addressed initial assessment, emergency activation, airway and breathing support, naloxone administration, positioning and monitoring, and post-rescue care. 'Yes, I know how' responses received one point; 'No' and 'Not sure' responses received zero points. Total scores ranged from 0 to 16 and were categorized as low (0–7), moderate (8–11), or high (12–16). In the current analytic sample, internal consistency was high (Cronbach's $\alpha = 0.912$).

Instrument adaptation, validity, and reliability

All study instruments were administered in English; therefore, translation and back-translation were not required. The OOKS and OOAS were used in their English-language forms, and the study-developed first-aid preparedness questionnaire was prepared in English. Content validity and contextual appropriateness of the instruments were reviewed by a multidisciplinary expert panel with expertise in community health nursing, emergency care, and substance-use management. Experts assessed relevance, clarity, and alignment with the study objectives, and minor wording changes were made before pilot testing.

Internal consistency in the study sample was Cronbach's $\alpha = 0.873$ for the OOKS, $\alpha = 0.747$ for the OOAS, and $\alpha = 0.912$ for the first-aid preparedness questionnaire.

Pilot study

The questionnaires were pilot-tested with 15 primary health care nurses to assess clarity, feasibility, completion time, and preliminary reliability. Pilot participants were excluded from the main analysis.

Data-collection procedure

Data were collected from May to July 2026. Center administrators distributed the survey link through official email and WhatsApp groups. The first page contained study information and an electronic consent statement. Participants who preferred assistance could complete the survey on a tablet or smartphone with technical support from a trained nurse while privacy was maintained. Completion required approximately 15–25 minutes. Required-response settings and unique access codes were used to reduce missing items and duplicate submissions.

Bias and data-quality safeguards

A standardized electronic questionnaire and identical participant instructions were used across centers. Required-response settings and unique access codes reduced item non-response and duplicate submissions. The use of convenience sampling and self-reported measures remained potential sources of selection and information bias and was considered when interpreting the findings.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 26. The dataset was screened for completeness, duplicate records, and valid response ranges; no missing values were imputed. Categorical variables were summarized using frequencies and percentages. Scale scores were summarized using means and standard deviations, together with medians, interquartile ranges, and observed ranges because the distributions were markedly skewed. Associations among total knowledge, attitude, and preparedness scores were examined using two-sided Spearman rank correlations. Because the preparedness score was an overdispersed count ranging from 0 to 16, a negative binomial regression model was fitted. Candidate predictors were age category, educational-level category, residence, experience category, total knowledge score, and total attitude score. Family income was excluded from the final model because of collinearity with residence. Results are reported as incidence rate ratios (IRRs), 95% confidence intervals, and p values. Statistical significance was set at $p < 0.05$.

Ethical considerations

The study was approved by the Research Ethics Committee of the Faculty of Nursing, Tanta University (approval code 963-5-2026) before recruitment. Administrative permission was obtained from the participating primary health care centers and the relevant health directorate. Participation was voluntary, electronic informed consent was required before access to the questionnaire, and participants could withdraw before submission without penalty. No direct identifiers were collected, and data were stored securely.

Use of generative artificial intelligence in manuscript preparation

ChatGPT (OpenAI) was used to assist with English-language editing and improve clarity. All scientific content, statistical interpretation, and conclusions were reviewed and approved by the authors, who take full responsibility for the accuracy and integrity of the manuscript.

Results

Participant characteristics

Among the 131 participants, 98 (74.8%) were women and 33 (25.2%) were men. Most participants were aged 20 to < 25 years ($n = 76$, 58.0%), married ($n = 107$, 81.7%), educated to bachelor's level ($n = 122$,

93.1%), and living in urban areas ($n = 86$, 65.6%). Ninety-one participants (69.5%) were in the 5 to < 10 years of experience category. Exact age and experience means were not calculated because the dataset contained grouped rather than continuous values (Table 1).

Knowledge, attitudes, and preparedness

The mean total knowledge score was 9.01 ± 7.01 out of 45; the median was 11 (IQR 2–15), and the observed range was 0–26. Under the prespecified < 60% cutoff, all 131 participants (100%) were classified as having low knowledge. Naloxone use had the lowest mean percentage of the possible domain score (17.9%), followed by overdose risks (20.1%), overdose signs (20.6%), and actions during overdose (22.3%) (Table 2).

The mean total attitude score was 104.19 ± 8.51 out of 140; the median was 104 (IQR 97.5–111), and the observed range was 82–121. Sixty-six participants (50.4%) were classified as neutral and 65 (49.6%) as positive; none were classified as negative (Table 3).

The mean total preparedness score was 1.79 ± 3.29 out of 16; the median was 1 (IQR 0–2), and the observed range was 0–15. Most participants had low preparedness ($n = 123$, 93.9%); no participant was in the moderate category, and 8 (6.1%) were in the high category. The weakest domains by percentage of maximum score were post-rescue care (6.5%), emergency response (8.4%), and naloxone administration (9.7%); airway and breathing support was highest but remained low (17.3%) (Table 4).

Correlations and multivariable analysis

Total attitude was positively correlated with preparedness (Spearman $\rho = 0.565$, $p < 0.001$). Knowledge was not significantly correlated with attitude ($\rho = -0.026$, $p = 0.770$) or preparedness ($\rho = -0.147$, $p = 0.094$) (Table 5).

The negative binomial regression model was statistically significant (likelihood-ratio $\chi^2(6) = 66.53$, $p < 0.001$; McFadden pseudo- $R^2 = 0.143$). Rural residence was associated with a lower expected preparedness score (IRR = 0.063, 95% CI 0.019–0.213, $p < 0.001$). Higher educational-level category was also associated with a lower expected preparedness score (IRR = 0.298, 95% CI 0.121–0.733, $p = 0.008$); this finding should be interpreted cautiously because almost all participants held a bachelor's degree. Age, experience, total knowledge, and total attitude were not independently associated with preparedness (all $p > 0.05$) (Table 6).

Table 1
Participant characteristics (n = 131)

Characteristic	n	%
Sex: male	33	25.2
Sex: female	98	74.8
Age: <20 years	7	5.3
Age: 20 to < 25 years	76	58.0
Age: 25 to < 30 years	32	24.4
Age: 30 to < 35 years	16	12.2
Marital status: married	107	81.7
Marital status: divorced	15	11.5
Marital status: widowed	9	6.9
Education: diploma	6	4.6
Education: bachelor's degree	122	93.1
Education: master's degree	3	2.3
Family income: sufficient	79	60.3
Family income: insufficient	52	39.7
Residence: urban	86	65.6
Residence: rural	45	34.4
Experience: <5 years	11	8.4
Experience: 5 to < 10 years	91	69.5
Experience: 10 to < 15 years	23	17.6
Experience: 15 to < 20 years	6	4.6

Table 2
Opioid-overdose knowledge scores by domain (n = 131)

Domain	Mean (SD)	Median (IQR)	Range	% max
Overdose risks	1.81 (3.23)	0 (0–2)	0–9	20.1
Overdose signs	2.06 (3.62)	0 (0–4)	0–10	20.6
Actions during overdose	2.45 (4.12)	0 (0–3)	0–11	22.3
Naloxone use	2.69 (2.16)	2 (1–4.5)	0–8	17.9
Total knowledge	9.01 (7.01)	11 (2–15)	0–26	20.0

OOKS, Opioid Overdose Knowledge Scale; IQR, interquartile range; SD, standard deviation. All 131 participants were classified as low using the prespecified cutoff of < 60%. Cronbach's α = 0.873.

Table 3
Opioid-overdose attitude scores and classifications (n = 131)

OOAS result	Mean (SD)	Median (IQR)	n (%)
Total score (range 82–121)	104.19 (8.51)	104 (97.5–111)	131 (100)
Negative	-	-	0 (0.0)
Neutral	-	-	66 (50.4)
Positive	-	-	65 (49.6)

OOAS, Opioid Overdose Attitudes Scale; IQR, interquartile range; SD, standard deviation. Cronbach's α = 0.747.

Table 4
Self-reported first-aid preparedness scores by domain (n = 131)

Domain	Mean (SD)	Median (IQR)	Range	% max
Initial assessment	0.37 (0.54)	0 (0–1)	0–2	12.2
Emergency response	0.17 (0.51)	0 (0–0)	0–2	8.4
Airway and breathing support	0.52 (0.84)	0 (0–1)	0–3	17.3
Naloxone administration	0.29 (0.78)	0 (0–0)	0–3	9.7
Positioning and monitoring	0.32 (0.76)	0 (0–0)	0–3	10.7
Post-rescue care	0.13 (0.44)	0 (0–0)	0–2	6.5
Total preparedness	1.79 (3.29)	1 (0–2)	0–15	11.2

IQR, interquartile range; SD, standard deviation. Total categories: low 0–7, $n = 123$ (93.9%); moderate 8–11, $n = 0$; high 12–16, $n = 8$ (6.1%). Cronbach's $\alpha = 0.912$.

Table 5
Spearman correlations among total scores ($n = 131$)

Variable pair	Spearman ρ	p value
Knowledge-attitude	-0.026	0.770
Knowledge-preparedness	-0.147	0.094
Attitude-preparedness	0.565	< 0.001

Spearman rank-correlation coefficients; all tests were two-sided.

Table 6
Factors associated with first-aid preparedness (negative binomial regression)

Predictor	B	SE	IRR	95% CI	p value
Age category	0.082	0.283	1.086	0.623–1.892	0.771
Educational level	-1.210	0.459	0.298	0.121–0.733	0.008
Rural residence	-2.759	0.619	0.063	0.019–0.213	< 0.001
Experience category	0.035	0.220	1.035	0.672–1.595	0.875
Total knowledge score	-0.033	0.018	0.968	0.934–1.002	0.066
Total attitude score	-0.004	0.023	0.996	0.953–1.042	0.875

Model: likelihood-ratio $\chi^2(6) = 66.53$, $p < 0.001$; McFadden pseudo- $R^2 = 0.143$; dispersion $\alpha = 0.864$, $p < 0.001$. B, regression coefficient; CI, confidence interval; IRR, incidence rate ratio; SE, standard error. Age, education, and experience were entered as ordered categories. Rural residence was contrasted with urban residence. Family income was excluded because of collinearity with residence.

Discussion

This multicenter cross-sectional study identified marked deficits in opioid-overdose knowledge and self-reported first-aid preparedness among primary health care nurses. All participants scored below the prespecified 60% knowledge threshold, and 93.9% were classified as having low preparedness. Attitude classifications were divided almost equally between neutral and positive categories. Attitude was strongly associated with preparedness in the bivariate analysis, but neither attitude nor knowledge remained significant after adjustment in the count-regression model.

Knowledge scores were particularly low for naloxone use, although all four knowledge domains averaged less than one quarter of their maximum possible scores. This pattern is consistent with reports of

incomplete overdose and naloxone knowledge among health care professionals [11, 13]. The very low observed scores indicate a need for education that emphasizes overdose recognition, respiratory support, naloxone indications, routes, repeat dosing, and post-reversal monitoring.

Participants were almost evenly divided between neutral and positive attitude categories, and no participant was classified as having a negative attitude. More favorable attitudes were positively associated with preparedness at the bivariate level, supporting the relevance of confidence, readiness, and perceived professional responsibility [14, 15]. However, attitude was not independently associated with preparedness in the adjusted model and should not be interpreted as a causal determinant.

Preparedness was extremely low: the median participant endorsed only one of 16 actions, and the weakest domains were post-rescue care, emergency response, and naloxone administration. These findings support simulation and skills-based training rather than information-only approaches [16, 17]. However, the questionnaire measured perceived knowledge of how to act rather than directly observed clinical performance, so the results should be interpreted as self-reported preparedness.

Knowledge was not significantly associated with preparedness. This may reflect the restricted and highly skewed score distributions, differences between factual knowledge and perceived ability to perform emergency actions, or the influence of unmeasured organizational and training factors. Rural residence and educational category were associated with preparedness in the adjusted model, but these findings should be interpreted cautiously because the educational categories were highly imbalanced and the demographic variables were analyzed as grouped categories. The associations do not establish causality.

The findings support a competency-based approach to opioid-overdose education in primary care. Training should cover risk factors and clinical recognition, emergency activation, airway opening and assisted ventilation, recovery positioning, naloxone routes and repeat dosing, monitoring after reversal, and referral. It should also address stigma, communication with patients and families, and professional roles. Organizations should provide accessible protocols, locally appropriate naloxone policies, simulation refreshers, and audit of training uptake [1, 8].

Strengths and limitations

Strengths include recruitment from seven primary health care centers, use of established measures for knowledge and attitudes, reporting of internal consistency in the study sample, assessment of multiple preparedness domains, and use of a count-regression model appropriate for an overdispersed outcome.

Several limitations should be considered. Convenience sampling may have introduced selection bias, and recruitment from one city limits generalizability. The cross-sectional design precludes temporal or causal inference. Preparedness was self-reported rather than directly observed and was therefore susceptible to information and social-desirability bias, and researcher-defined category cutoffs may reduce comparability with other studies. Age and experience were analyzed as grouped categories, and

the score distributions were highly skewed and sparse. Educational categories were markedly imbalanced, and family income was excluded from the adjusted model because of collinearity with residence. The multivariable findings should therefore be considered exploratory and require confirmation in larger, more diverse samples.

Conclusions

Primary health care nurses in this study showed severe gaps in opioid-overdose knowledge and self-reported first-aid preparedness, particularly for naloxone, emergency response, and post-rescue care. More favorable attitudes were associated with better preparedness in bivariate analysis but not after adjustment. Primary care organizations should implement standardized, simulation-based overdose-response education combining technical knowledge, practical skills, confidence building, and stigma reduction. Larger multicenter and interventional studies using objective skills assessments are needed.

Abbreviations

OOAS

Opioid Overdose Attitudes Scale

OOKS

Opioid Overdose Knowledge Scale

OD

opioid use disorder

PHC

primary health care

STROBE

Strengthening the Reporting of Observational Studies in Epidemiology

WHO

World Health Organization

Declarations

Ethics approval and consent to participate

The study was approved by the Research Ethics Committee of the Faculty of Nursing, Tanta University (approval code 963-5-2026). Administrative permission was obtained from the participating primary health care centers and the relevant health directorate. Electronic informed consent was obtained from all participants before they accessed the questionnaire.

Consent for publication

Not applicable.

Availability of data and materials

The de-identified dataset used and/or analyzed during the current study is available from the corresponding author on reasonable request and subject to applicable ethical and institutional requirements.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

ALA, GSH, and HIM conceptualized the study, developed the study instruments, participated in data collection and interpretation of the results, prepared the initial draft, and contributed to manuscript revision. MNAE, LSM, and HRAE contributed to data collection, interpretation of the results, and critical revision of the manuscript. ALA and GSH supervised the research process and provided overall guidance. All authors read and approved the final manuscript and agree to be accountable for the work.

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Figures

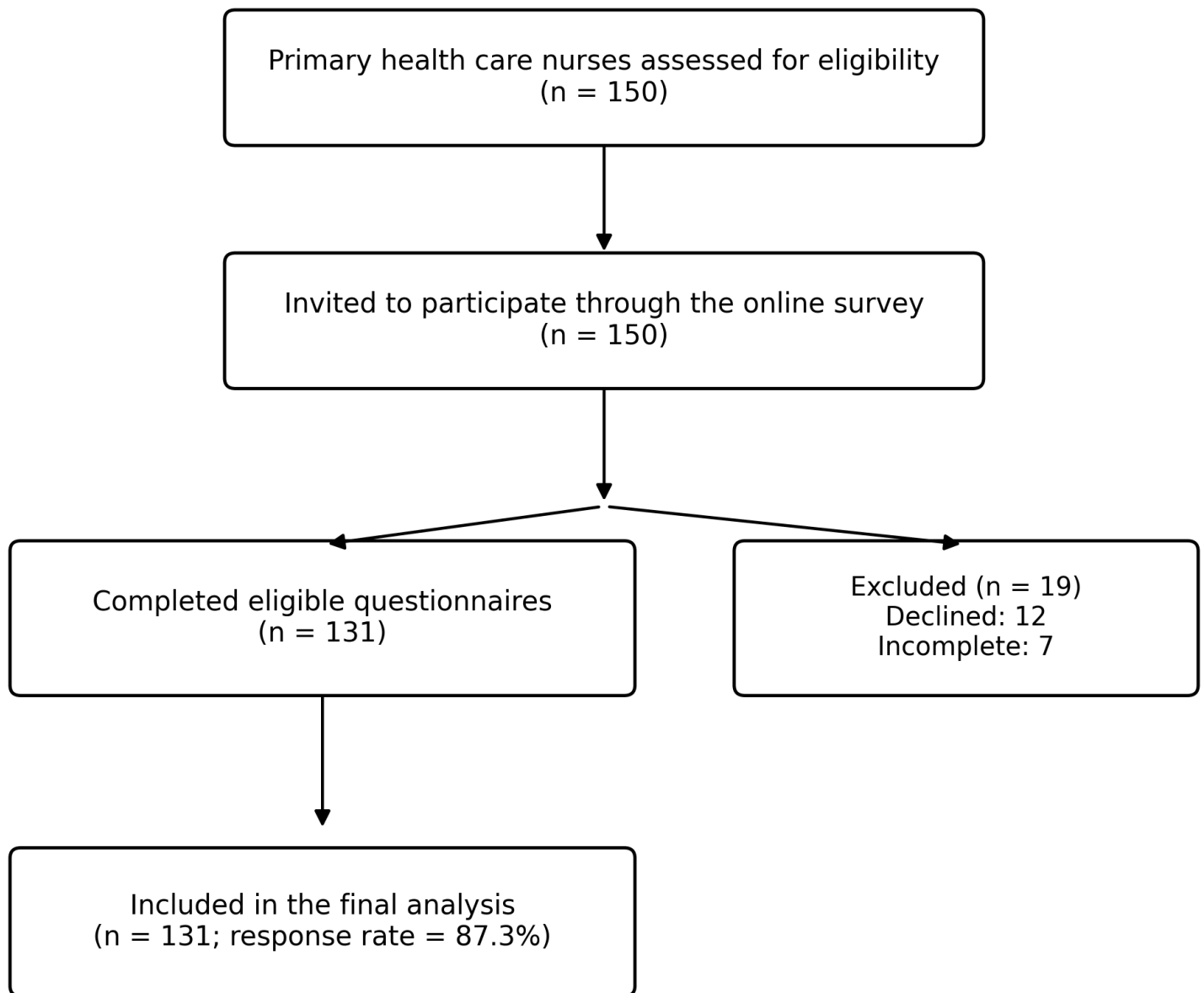


Figure 1

Participant recruitment and inclusion in the final analysis.