Clinical Audit

Compliance with documentation of NB-UVB phototherapy protocols in Aziz Fatima Hospital, Faisalabad: A closed-loop audit

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Abstract

Background NB-UVB phototherapy is an established treatment modality for several dermatological conditions. Safe delivery requires appropriate patient selection, dose determination, monitoring, and adequate documentation throughout treatment. Clinical audit can identify deficiencies in NB-UVB phototherapy practice and documentation and provide an opportunity for targeted quality improvement. Therefore, a closed-loop audit was conducted in the Dermatology Department of Aziz Fatima Hospital, Faisalabad, to assess documented compliance with predefined NB-UVB phototherapy standards and identify areas requiring improvement.

Objective To assess documented compliance with predefined NB-UVB phototherapy standards and evaluate changes in documented compliance following implementation of quality-improvement measures in the Dermatology Unit of Aziz Fatima Hospital, Faisalabad.

Methods Thirty patients receiving NB-UVB phototherapy were selected in each audit cycle at Aziz Fatima Hospital, Faisalabad. A structured checklist was used for this closed-loop audit. Following the initial audit, a standardized phototherapy proforma and consent forms were introduced, the logbook was revised, and staff were educated on NB-UVB protocols. The first audit was conducted from June to September 2025, followed by an eight-week implementation period (November–December 2025). Re-audit was conducted from January to April 2026 using the same standards and a separate sample of 30 consecutive eligible patient records.

Results Thirty different eligible patient records were assessed in each audit cycle using nine predefined indicators. In the first audit cycle, two indicators-documentation of treatment indication and assessment of contraindications-already met the 100% target. Seven deficient indicators showed improvement in the re-audit: informed consent (0/30 to 30/30), protective measures (0/30 to 30/30), cumulative dose documentation (0/30 to 30/30), dose-increment documentation (10/30 to 30/30), adverse-effect assessment documentation (15/30 to 30/30), initial-dose documentation (25/30 to 30/30), and completion assessment (0/3 to 4/4). Thus, all nine predefined indicators met the 100% target among the eligible records assessed in the re-audit.

Conclusion Following implementation of quality-improvement measures, documented compliance increased from deficient baseline levels to 100% for all deficient predefined indicators among eligible records assessed during the re-audit.

Keywords Clinical audit; NB-UVB phototherapy; Documentation; Quality improvement; Dermatology.

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Introduction

NB-UVB phototherapy is a recognized treatment modality in dermatology. Multiple dermatological diseases are managed with NB-UVB phototherapy, such as psoriasis, vitiligo, atopic dermatitis, T-cell

lymphoma, and other inflammatory dermatoses. NB-UVB at wavelengths of 311-313 nm is associated with greater effectiveness and fewer adverse events than broadband UVB. Despite its balanced features and better patient tolerability, precise dose management and proper adherence to standard NB-UVB phototherapy protocols are important to achieving better outcomes.[1]

Variation in NB-UVB phototherapy practice has been reported internationally. An Australian survey of dermatologists demonstrated considerable variation in operator practices, dosing regimens, and protocols used for NB-UVB phototherapy. In response, an expert consensus group developed standardized recommendations for the use of NB-UVB phototherapy.[2]

To enhance the quality of NB-UVB phototherapy, clinical documentation has an important role. Precise and systematic documentation supports consistent patient care and helps healthcare professionals monitor treatment progress.

A closed-loop audit is useful for evaluating improvements in compliance with standard protocols after implementing changes suggested following the first audit.

Recent evidence from a tertiary dermatology centre in South Africa highlights the value of auditing phototherapy services to identify factors influencing treatment compliance. In a 12-year audit, 75.45% of patients discontinued phototherapy, with loss to follow-up, financial constraints, treatment improvement, side effects, and work commitments among the documented reasons. Such service-level audits can identify areas requiring improvement and inform recommendations for phototherapy services.[3]

Accurate measurement and monitoring of UV radiation exposure are important components of safe NB-UVB phototherapy practice. Documentation of treatment doses, cumulative exposure, adverse effects, and equipment-related parameters supports safe monitoring of NB-UVB phototherapy.[4]

Furthermore, International phototherapy guidelines emphasize appropriate patient selection, informed consent, assessment of contraindications, and dose monitoring as important components of NB-UVB phototherapy.[5]

Published local evidence on adherence to NB-UVB phototherapy standards is limited, particularly in resource-limited settings. Structured clinical audits can identify deficiencies and guide quality-improvement measures. Therefore, a closed-loop audit was conducted at Aziz Fatima Hospital, Faisalabad, to assess adherence to NB-UVB phototherapy standards and identify areas for improvement.

Aim To assess documented compliance with predefined NB-UVB phototherapy standards and evaluate changes in documented compliance following implementation of quality-improvement measures in the Dermatology Unit of Aziz Fatima Hospital, Faisalabad.

Standards

The audit standards were developed as locally agreed NB-UVB phototherapy standards for the Dermatology Department and were informed primarily by the BAD/BPG 2022 guideline.[1] The standards were operationalized into a structured audit checklist for consistent assessment across both audit cycles. Where local practice differed from the external guideline, the locally agreed departmental standard was applied consistently in both audit cycles.

Target Compliance 100% for each indicator (locally agreed quality-improvement target).

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Assessed components in this audit are:

Audit indicator	*Source*
Indication documented	BAD/BPG 2022 + locally agreed audit standards
Contraindications assessed	BAD/BPG 2022 + locally agreed audit standards
Written consent	BAD/BPG/service standards + locally agreed audit standards
Initial dose	BAD/BPG 2022 R3
Dose increments	Locally agreed audit standards informed by BAD/BPG 2022
Protective measures	Locally agreed audit standards informed by BAD/BPG 2022
Adverse-effect monitoring	Locally agreed audit standards informed by BAD/BPG 2022
Cumulative dose	Locally agreed audit standards informed by BAD/BPG 2022
Completion assessment	Locally agreed audit standards informed by BAD/BPG 2022

Methods

Study design A closed-loop clinical audit with two prospective audit cycles and an intervening quality-improvement phase.

Study settings Dermatology department of Aziz Fatima Hospital, Faisalabad.

Sampling technique and sample size Thirty consecutive eligible patient records were included in each audit cycle, consistent with the audit-based sampling approach described in the BAD/BPG 2022 guideline.

Inclusion criteria

1. Patients receiving narrowband UVB (NB-UVB) phototherapy in the Dermatology Department, Aziz Fatima Hospital, Faisalabad.
2. Patients whose NB-UVB treatment was administered during the specified audit period.
3. Patient records for which eligibility for the audit could be established.

Exclusion criteria

1. Patients receiving phototherapy modalities other than NB-UVB.
2. Records of patients who did not receive NB-UVB phototherapy treatment during the specified audit period.
3. Duplicate patient records.
4. Records those were unavailable or irretrievable at the time of audit.
5. Records with insufficient information to determine eligibility for the audit.

The audit was approved by the Ethics Review Committee of Aziz Fatima Hospital on 21.05.2025. No approval number was assigned. Individual patient consent was required for review of patient records for the audit. Patient confidentiality was maintained by assigning them unique patient ID.

This record-review consent was distinct from the informed consent obtained for NB-UVB treatment. Two cycles were included in this audit. Data collection was prospective in both cycles, from patients' files and NB-UVB phototherapy logbooks,

using same structured audit checklist and NB-UVB phototherapy guidelines by trained data collectors who were familiarized with audit criteria and operational definitions. Their role was to identify eligible records and extract data according to the predefined audit criteria. Where discrepancies were identified, the original treatment documentation was reviewed by the primary investigator for resolution. No independent assessor or independent data checker was involved.

The first audit cycle was conducted from 1 June 2025 to 30 September 2025, thirty patients who received NB-UVB phototherapy in this department were selected consecutively, according to inclusion and exclusion criteria. During the subsequent one-month period from 1 October 2025 to 31 October 2025, the audit findings were reviewed and deficiencies in NB-UVB phototherapy documentation and protocol compliance were identified. Based on these findings, quality-improvement measures were planned and implemented over an eight-week period from 1 November 2025 to 31 December 2025. The re-audit

was subsequently conducted from 1st January 2026 to 30th April 2026 using the same audit standards and data-collection tool, with a separate sample of 30 consecutive eligible patient records.

Absence of documentation was classified as non-compliance for documentation indicators; it was not interpreted as evidence that the corresponding clinical practice had not occurred.

Age, sex, underlying dermatological disorder, Fitzpatrick skin phenotype, and the stage of treatment were collected and mentioned in **Table 1**. These demographic and clinical characteristics of records, included in two audit cycles, were mentioned to describe the case mix of two independent consecutive samples.

Documentation of treatment indication, exclusion of contraindications, informed consent, calculation and documentation of the initial dose, documentation of dose increments, documentation of use of protective measures, recording of adverse effects, maintenance of cumulative dose records, and completion assessment documentation were assessed during data collection. Following review of the first audit cycle, the Head of the Department of Dermatology introduced and implemented the quality-improvement measures. A demonstration of the revised documentation procedures was conducted during a departmental meeting attended by dermatologists, residents, nurses, and NB-UVB phototherapy technicians. Following the departmental demonstration, the revised proforma, informed consent form, and NB-UVB phototherapy logbook were introduced into routine NB-UVB practice and used throughout the eight-week intervention period from 1 November to 31 December 2025. The meeting covered the use of the standardized documentation checklist and revised NB-UVB phototherapy logbook, documentation of informed consent, recording of treatment doses and dose increments, documentation of protective measures and adverse effects, and calculation and documentation of cumulative NB-UVB dose.

After 8 weeks of implementing the proposed measures, a re-audit was conducted to assess improved documented compliance. For each audit criterion, compliance was calculated as the number of compliant records divided by the applicable denominator and expressed as a percentage.

For the analysis of the data, SPSS version 26 was used. Appropriate descriptive and inferential statistics were used. To express the compliance with each audit criterion, frequency and percentage was used. Observations between two cycles were independent because a separate sample of 30 patient records was used for the re-audit. Fisher's exact test was used to compare the proportion of records between two audit cycles, and p-value less than 0.05 was considered statistically significant. As this was a quality-improvement audit, comparisons across individual audit indicators were considered exploratory, and no adjustment for multiple comparisons was applied.

Table 1 Demographic and clinical characteristics

Characteristic	*First audit (n=30)*	*Re-audit (n=30)*
Gender n (%)		
Male	10 (33.3%)	16(53.3%)
Female	20 (66.7%)	14 (46.7%)
Diagnosis n (%)		
Psoriasis	6 (20%)	5 (16.7%)
Vitiligo	10 (33.3%)	12 (40%)
Eczema	9 (30%)	10 (33.3%)
Other (Cutaneous T-cell Lymphoma, lichen planus)	5 (16.7%)	3 (10%)
Fitzpatrick skin type n (%)		
I	0	0
II	0	0
III	6 (20%)	7 (23.3%)
IV	12 (40%)	15 (50%)
V/VI	12 (40%)	8 (26.7%)
Treatment stage n (%)		
Newly initiated	13 (43.3%)	20 (66.7%)
Ongoing treatment	17 (56.7%)	10 (33.3%)
Maintenance/completion phase at entry	0	0

(Treatment stage refers to the patient's status at entry into the audit. Patients who subsequently reached treatment completion or discontinuation during the audit period were assessed separately for the completion-assessment indicator).

Audit Checklist and Operational Definitions

A structured audit checklist was used for both audit cycles. Each audit indicator was assessed according to predefined operational definitions. The unit of analysis was the patient record. For course-level indicators, one assessment was made per eligible patient record. For session-level indicators, only NB-UVB phototherapy treatment sessions occurring within the respective audit period were assessed. For patients who were already receiving NB-UVB phototherapy at the time of inclusion, assessment commenced from the session at which the patient entered the audit. Sessions occurring before the patient's inclusion in the audit were not assessed, and sessions occurring after the end of the respective audit period were not included.

Tale 2 Audit Checklist and Operational Definitions.

Audit indicator	*Operational definition of compliance*	*Level of assessment*
Indication documented	The clinical indication/diagnosis for NB-UVB treatment was documented in the patient record.	Course-level
Contraindications excluded	Relevant contraindications to NB-UVB phototherapy were assessed and documented as absent before/at initiation of treatment.	Course-level
Written informed consent	A dated, signed informed consent document for NB-UVB phototherapy was present in the patient record, and the consent date preceded the documented date of initiation of NB-UVB treatment.	Course-level
Correct initial dose calculation and documentation	Initial dose was considered compliant when the documented starting dose was appropriately determined according to MED testing or a small-area test, as applicable, in accordance with BAD/BPG 2022 recommendation R3.	Course-level
Dose increments recorded	For each eligible session requiring a dose change, the administered dose and change from the previous dose were documented according to the locally agreed audit standards, informed by BAD/BPG 2022 recommendations	Session-level
Protective eyewear/genital shielding	Protective-measure documentation was considered compliant only when all required protective measures, including protective eyewear and genital shielding where applicable, were documented for the eligible session. Partial documentation of required protective measures was classified as non-compliant.	Session-level
Adverse effects	Assessment of adverse effects, or explicit documentation that no adverse effects were present, was recorded at each eligible treatment visit.	Session-level
Cumulative dose	The cumulative NB-UVB dose was considered compliant when it was recorded and updated throughout the treatment course, with the cumulative value consistent with the documented individual treatment doses.	Course-level
Completion assessment	Assessment at completion/discontinuation of the treatment course was documented.	End-of-course

Scoring and denominator definitions

An indicator was classified as compliant when the predefined requirement was fulfilled and as non-compliant when the required documentation or action was absent or did not meet the predefined criterion. Missing documentation was not interpreted as evidence that clinical care had not occurred; however, for documentation indicators, absence of the required record was classified as non-compliant because the audit assessed documentation standards. Indicator-specific denominators were defined according to the applicability of each audit criterion. Course-level indicators, including treatment indication, contraindication assessment, informed consent, initial-dose documentation, and cumulative-dose documentation, were assessed once for each eligible patient record. All 30 patient records in each audit cycle were eligible for assessment of initial-dose documentation. For patients already receiving NB-UVB at audit entry, initial-dose compliance was assessed using available documentation from treatment initiation, including the documented starting dose and, where applicable, MED or small-

area testing. The timing of informed consent was verified by comparing the date on the signed consent form with the documented date of NB-UVB treatment initiation; consent was considered compliant only when it preceded treatment initiation.

Session-level indicators, including dose increments, protective measures, and adverse-effect assessment, were assessed only for eligible NB-UVB sessions occurring within the respective audit period. The patient record was considered compliant when the required documentation was present for all eligible sessions assessed during that period. All 30 patient records in each audit cycle had at least one eligible treatment session requiring a dose change and were therefore included in the denominator for the dose-increment indicator.

Completion assessment was evaluated only among patients whose treatment course reached completion or discontinuation during the respective audit period.

Results

In the first audit cycle, a total 30 patient records were reviewed. After implementation of the quality-improvement measures, a separate sample of 30 patient records was assessed during the re-audit. Documentation of treatment indication and exclusion of contraindications were 100% compliant in both audit cycles (30/30, 100% vs. 30/30, 100%; Fisher's exact test, *P*=1.000; **Table 3**)

Documentation of written informed consent was 0/30 (0%) in the first audit cycle compared with 30/30 (100%) during the re-audit (Fisher's exact test, *P*<0.001; **Table 3**).

Several deficiencies were identified during the first audit cycle. Documentation of written informed consent, protective measures, and cumulative dose records increased from 0% to 100% during the re-audit. Documentation of dose increments increased from 33.3% to 100%, adverse-effect assessment from 50.0% to 100%, and initial-dose documentation from 83.3% to 100%. Completion assessment increased from 0/3 (0%) to 4/4 (100%). Detailed comparisons between the two audit cycles are presented in **Table 3**. The comparison of documented compliance between the two audit cycles is shown in **Figure 1**.

Two indicators-documentation of treatment indication and assessment of contraindications- were already at 100% compliance in both audit cycles. The remaining seven indicators, which were deficient during the first audit cycle, reached 100% documented compliance among the eligible records assessed in the re-audit. The small sample size limits the precision of these estimates. For 30/30 observations, the two-sided exact 95% confidence interval is approximately 88.4%-100%.The audit process and chronology are summarized in **Figure 2**.

Table 3 Comparison of compliance with NB-UVB phototherapy standards between the first audit cycle and re-audit.

Audit criterion	*First audit cycle, n (%)*	*Re-audit n (%)*	*Fisher's exact p-value*
Indication documented	30/30 (100%)	30/30 (100%)	1.000
Contraindications excluded	30/30 (100%)	30/30 (100%)	1.000
Informed consent obtained	0/30 (0%)	30/30 (100%)	<0.001
Correct initial dose calculation and documentation	25/30 (83.3%)	30/30 (100%)	0.052
Dose increments recorded	10/30 (33.3%)	30/30 (100%)	<0.001
Protective eyewear and genital shielding documented	0/30 (0%)	30/30 (100%)	<0.001
Documentation of adverse effects or confirmation of absence of adverse effects	15/30 (50.0%)	30/30 (100%)	<0.001
Cumulative dose record maintained	0/30 (0%)	30/30 (100%)	<0.001
Completion assessment documented	0/3 (0%)	4/4 (100%)	0.029

Note: Fisher's exact test was used for comparison of independent proportions. Two-sided p<0.05 was considered statistically significant.

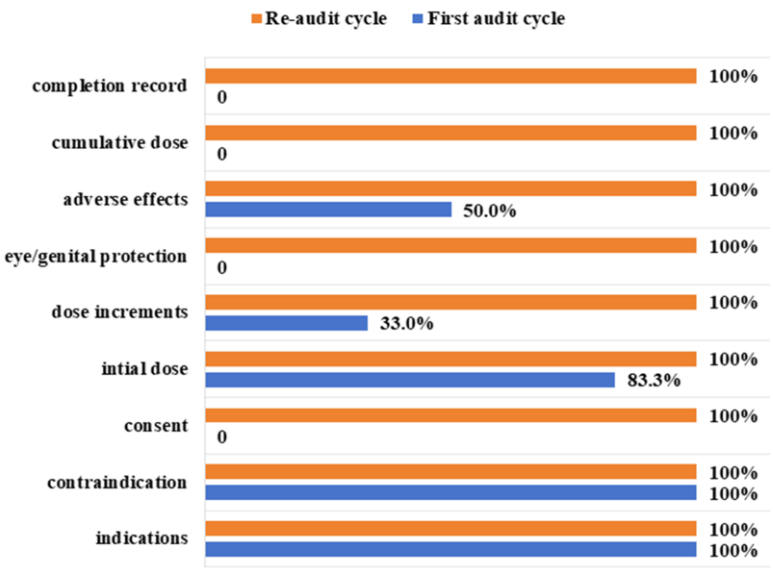


Figure 1 Graphical comparison of compliance with NB-UVB phototherapy standards between the first audit cycle and re-audit

Discussion

This closed-loop audit assessed compliance with standard protocols and documentation of NB-UVB phototherapy in the dermatology unit of a tertiary care hospital. For documentation of indications and contraindications, compliance was excellent-100%- in the first audit cycle. However, there were deficiencies found in some documentation-related parameters, for example, informed consent, documentation of protective measures, cumulative dose records, treatment monitoring, and documentation of assessment of patients after completion of treatment.

Deficiencies observed in the results of the initial audit primarily reflected inadequate documentation rather than deficiencies in clinical care. But clinical observations were not recorded as separate audit outcomes. Therefore, this audit only evaluates documented compliance. Absence of documentation should not be interpreted as absence of clinical practice.

After interpretation and discussion of the results of the initial audit with senior faculty and the head of department, the following parameters were suggested for quality improvement: standard NB-UVB phototherapy protocols, written informed consent forms, revision of NB-UVB phototherapy logbooks, and staff education. After implementation of the following quality improvement measures, compliance to documentation improved to 100% across all deficient audit parameters. These findings indicate the quality-improvement process can improve documented compliance.

Recent evidence from a tertiary dermatology centre in South Africa demonstrates the value of auditing phototherapy services to identify factors affecting treatment compliance. Shelembe *et al*. reported substantial treatment discontinuation and identified loss to follow-up, financial constraints, side effects, and work commitments among the documented reasons.[3]

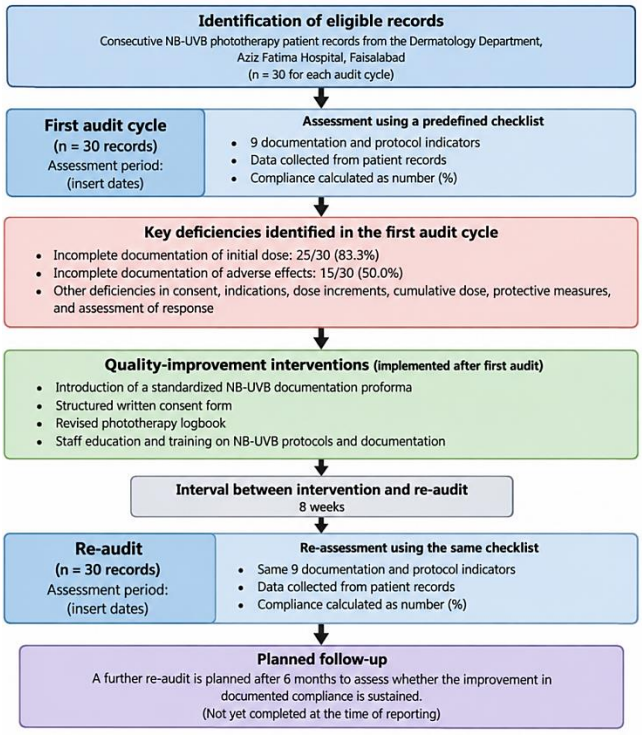


Figure 2 Study specific flow diagram showing audit progress, interventions and re-audit in dermatology department, Aziz Fatima Hospital, Faisalabad.

Although their audit focused on treatment continuation rather than documentation of NB-UVB protocols, it supports the role of structured audits in identifying areas for improvement in phototherapy services. In Pakistan, published evidence evaluating documentation and adherence to standardized NB-UVB phototherapy protocols in hospital-based dermatology services appears limited

Keeping in view the present findings of this closed loop audit, we cannot conclude any improvement in patient safety, because this audit did not assess clinical efficacy or patient safety and adverse effects due to treatment. Therefore, It is important to mention that improvements as a result of this audit resulted in better documentation and record-keeping practices rather than better clinical outcomes.

Limitations

The findings of this audit are not generalized because it was conducted in a single tertiary care dermatology unit with a relatively small sample size of 30 patient records per audit cycle. As separate consecutive samples were included in both audit cycles, case mix differences between cycles cannot be excluded. Because the re-audit commenced immediately after the eight-week intervention period, long-term sustainability of the observed improvement could not be evaluated. Only three patients in the first audit cycle and four patients in the re-audit reached completion of treatment. Because the denominator for this indicator was small, the precision of the completion-assessment estimate was limited.

There are multiple factors which may have contributed to observed improvement in documentation. For example, changes in staff behavior, awareness of the audit (Hawthorne effect), observation by audit team and assessor bias. The individual contribution of the standardized proforma, consent form, revised logbook, and staff education cannot be determined because these interventions were implemented simultaneously. Moreover, this audit assessed compliance with documentation and standard protocols rather than treatment outcomes and patient satisfaction. This audit cannot demonstrate whether these quality improvement measures resulted in better clinical outcomes. It only shows substantial improvement in documentation practices. To ensure the sustainability of results and improve patient care and safety, long-term follow-up audits are required.

The number of eligible NB-UVB sessions available for assessment may have differed between the two audit cycles because the distribution of treatment stage differed between the samples, with a higher proportion of newly initiated patients in the re-audit. This difference in session exposure may have influenced session-level documentation indicators.

Conclusion

In this closed-loop audit, major parameters of baseline documentation practices for NB-UVB phototherapy were found to be deficient. Following the introduction of simple parameters, including a standard NB-UVB phototherapy proforma, a consent documentation system, and staff education, documented compliance increased to 100% for all predefined indicators during re audit. Structured documentation tools and regular audit cycles can have better effects on documented adherence to narrowband UVB NB-UVB phototherapy protocols within dermatology practice. More audit cycles in future, assessing clinical safety outcomes with long-term follow-up, are required in order to assess the improvements in patient safety due to improved documentation and protocol adherence.

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Conflict of interest No conflict of interest.

Data availability The audit dataset and statistical output are not publicly available

Author's contribution

MA: Substantial contribution to acquisition of date and manuscript writing.

AI,ET: Substantial contribution to conception and study design, critically revision of the manuscript.

SS,UBY: Substantial contribution to analysis and interpretation of date, manuscript writing.

MR: Substantial contribution to conception and study design, manuscript writing.

Every author has given final approval of the manuscript version to be published and agreed to be accountable for all aspects of the work.

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