


# *Addis Ababa University*

## *College of Health Science, School of Medicine*

## *Department of Surgery, Plastic & reconstructive surgery Unit*

***"Prevalence and Patterns of Secondary Lip and Nasal Deformities Following Primary Cleft Lip Surgery in Patients Operated at Yekatit 12 Hospital Medical College (2019 – 2024 GC)"***

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**A research thesis submitted to Department of surgery, School of medicine, college of health science, Addis Ababa University; in Partial Fulfillment for the Requirement of specialty certificate in Plastic and Reconstructive Surgery.**

***"Prevalence and Patterns of Secondary Lip and Nasal Deformities Following Primary Cleft Lip Surgery in Patients Operated at Yekatit 12 Hospital Medical College (2019 – 2024 GC)"***

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## Declaration

I, the undersigned, declare that this is my original work that has never been presented in this or any other university and that all the resources and materials used for the thesis have been fully acknowledged

This thesis by **Dr. Selamawit Tesfaye** is accepted in its present form by the board of examiners, satisfying the thesis requirement for the specialty certificate in Plastic and Reconstructive Surgery.

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## Acronyms and abbreviations

**CL –** Cleft lip

**CLP**- congenital lip and palate deformity

**CP -** Cleft palate

**GC** – Gregorian calendar

**IRB**- Institutional Review Board

**PLAN –** Pennsylvania Lip and Nose score

**Y12HMC -** Yekatit 12 Hospital Medical College

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# ABSTRACT

**Introduction**

Cleft lip repair frequently results in secondary lip and nasal deformities that impact aesthetic appearance and functional outcomes. These deformities vary by region and surgical technique, and their prevalence is particularly understudied in East African settings. In this study, I evaluate the prevalence, severity, and predictors of secondary deformities in patients with cleft lip treated at Y12 HMC.

**Methodology**

A retrospective cross-sectional study was conducted on 202 patients who had primary lip repair and returned for follow-up. Data were collected on demographics, cleft type, surgical technique, perioperative characteristics, postoperative lip and nasal outcomes, and parental satisfaction. Statistical analysis included univariate and multivariate logistic regression to identify predictors of postoperative deformities and the need for revision surgery.

**Results**

The majority of patients were male (63.9%), and unilateral clefts were most common (75.7%). Millard repair was used in 95.5% of cases. Moderate to severe lip deformities were observed in 62.4% of patients, while 54.5% demonstrated moderate to severe nasal deformities, including nostril asymmetry and columella shortening. Primary rhinoplasty was performed in only 37.1% of patients. Significant predictors of deformities included mucosal excess, scar quality, type of cleft, age at primary repair, primary rhinoplasty, nostril symmetry, and columella appearance. Parents satisfaction with postoperative outcomes remained high despite the prevalence of deformities.

**Conclusion**

Secondary cleft lip and nasal deformities are frequent among patients treated at Y12 HMC. The findings highlight the need for timely surgical intervention, improved soft-tissue handling, and broader incorporation of primary nasal correction to reduce long-term aesthetic and functional complications. Strengthening follow-up and outcome assessment may further enhance cleft care quality



**Key words;** ***Congenital cleft lip; secondary deformity, primary repair; surgical revision.***

# 1 Introduction

## 1.1.1 Background

Cleft lip and palate anomalies (CLP), which are one of craniofacial malformations, are thought to be the most prevalent types of birth defects. (1) Anatomical changes brought on by the various forms of cleft lip have a significant impact on facial function and appearance, as well as the psychological well-being of patients from infancy to adulthood.(2)

Genetic susceptibility in the family, maternal diet, medicines, particularly folate antagonists, and teratogen exposure are risk factors for CLP.(3) Clinical designation of CLPs is also based on their location and descriptive terminology. Based on location, it can be classified as unilateral or bilateral. Based on the description of the involvement, it can be classified as Complete, incomplete, or sub-mucus [3]. There are two categories of clefts: solitary and syndromic. (1)

Providing support for infants born with cleft deformity can be tough, particularly when dealing with complex subsequent abnormalities. Correctly diagnosing the underlying issue is a crucial first step in assessing these patients. The majority of the time, it necessitates a thorough comprehension of both the initial issue and the repair method used.(3)

Various surgical methods are employed to repair cleft lip, but surgeons do not agree on the best protocols, timing, or techniques for the repair.(4) Even if functional results can now be evaluated more objectively, acceptable aesthetic results are still subjective.(5)

Understanding the prevalent secondary abnormalities encourages more research into the potential causes of these deformities, aids in assessing the various repair methods, and is an essential step in the development of the various repair methods. The entire procedure also contributes to less procedures for this congenital condition, which is quite prevalent in various regions of the world. It also lessens the economic burden on society, the psychological anguish of deformity on the entire family, and the risk of the patient experiencing repeated surgical trauma.(6)

## 1.1.2 Statement of the problem

CLP contributes significantly to global handicap and even mortality and makes up a large percentage of congenital abnormalities of the craniofacial region. Numerous individuals can undergo surgical care for the primary CLP locally through programs run by non-governmental organizations. (3) . The results of surgical therapy for orofacial clefts have not been extensively and impartially documented in Ethiopian studies. Therefore, in a developing nation such as Ethiopia, there is an urgent need for reliable data on the surgical treatment of secondary cleft malformations. (7) Patients' concerns about post-primary surgery repair are frequently disregarded. Patients are not sufficiently aware that revision operations may be necessary. As a result of their condition, they endure psychological anguish and incur severe socioeconomic consequences, forcing them to accept their fate.
Since the majority of SCLP abnormalities are treatable, a procedure for managing them must be developed.(3) The study's conclusions will add to the body of knowledge already available on the surgical treatment of cleft lip deformities. It will also be a useful tool for medical professionals in determining the necessity of cleft management and guaranteeing that suitable centers for the best possible treatment provision in Ethiopia, especially when evaluating secondary deformities.(7)

### 1.1.3 Significance of the study

This study describes pattern of lip and nasal deformity after primary cleft repair. The information gathered will help create a deformity management plan for improved patient outcomes with CLP. Additionally, it will provide important data on the extent and patterns of lip and nasal deformities among patients who had primary lip repair. The findings are vital for enhancing the quality of care for individuals born with cleft lip and can help as a base for future research and interventions

## 2 Literature review

The global prevalence of cleft lip and palate (CLP) ranges from roughly 2.7 to 9.92 cases per 1,000 live births, with significant variation by nation, ethnicity, and area. (8) For example, the rate is highest in Asian and Native American populations and lowest in African populations. (9) More than half of orofacial clefts have lip involvement. (9) While these figures represent the prevalence of primary clefts, secondary cleft lip and nasal deformities commonly develop after initial surgical repair. The exact global prevalence of secondary lip and nose deformities is not separately quantified in the literature, but they are recognized as frequent complications following primary cleft surgeries, often requiring further surgical intervention. (10)

A large retrospective study of 92 patients having bilateral cleft lip nasal deformities undergoing revision rhinoplasty showed "significant aesthetic improvements when utilizing bilateral reverse-U flap and septal extension graft techniques, with 3D analysis confirming closer-to-normal nasal morphology postoperatively." (11)

Studies indicate that secondary nasal deformities are common complications following initial cleft surgeries, often requiring further reconstructive procedures to address altered anatomy and scarring. (10)

Regions in East and Southeast Asia show the highest occurrence and severity of secondary cleft nasal deformities. Studies comparing the severity of unilateral cleft lip and associated nasal deformities across Asia, Sub-Saharan Africa, and the Middle East/North Africa found that the Asian region—particularly the Philippines, Vietnam, China, and Cambodia—had the most severe cases. The Philippines demonstrated the highest mean severity, followed closely by Vietnam and China. These findings mirror the pattern of overall cleft lip and palate incidence, which is also highest in Asian populations.(12)

In contrast, African populations exhibit the lowest prevalence and severity of cleft-related nasal deformities, while populations in the Middle East and North Africa fall in between these two extremes16. The higher rates and severity in Asian regions are thought to be influenced by both genetic and environmental factors. (12)

A study from Taiwan analyzed 92 patients with bilateral cleft lip nasal deformities who underwent secondary open rhinoplasty between 2013 and 2021. Using 3D anthropometric analysis, the research demonstrated significant aesthetic improvements and a low complication rate, highlighting the prevalence of secondary nasal deformities requiring revision surgery in Asian populations. (11)

A study done in Pakistan in 2012, 189 cases of secondary unilateral cleft lip abnormalities were chosen. Interviews were conducted on these cases, and the malformations were noted. For comparison, pictures were taken before and after surgery. The most prevalent secondary cleft lip malformations were unfavorable scar, which were followed by a short lip and vermilion notch.(6)

In summary, East and Southeast Asia (notably the Philippines, Vietnam, China, and Cambodia) have the highest occurrence and most severe presentations of secondary cleft nasal deformities worldwide. (10)

A case report and literature review from a European context discussed the iatrogenic nature of secondary cleft deformities, stressing the importance of meticulous primary surgery to reduce secondary deformities. The paper presented surgical approaches in order to treat secondary deformities and improve patients' quality of life.(13)

Secondary cleft lip and nasal deformities commonly develop following primary surgical repair due to altered anatomy and surgical scarring. These secondary deformities, including septal deviation, nasal tip malformation, and alar cartilage malposition, represent significant reconstructive challenges in rhinoplasty. (10) While exact prevalence figures for secondary lip and nose deformities in Europe are lacking, the frequency of primary cleft conditions and the high rate of secondary nasal deformities after surgery imply that secondary deformities are a common clinical issue requiring revision surgeries. (10) The incidence of secondary deformities after primary lip repair has been documented in the literature range widely, with some studies indicating rates as high as 35% to 85%, depending on the definitions and populations studied. (14)

A study of 219 patients treated at a North American craniofacial center in 2009 analyzed outcomes retrospectively of secondary correction after rhinoplasty in unilateral clefts. The study indicated that subsequent nasal abnormalities are prevalent following initial repair, with 76% of patients achieving significant functional and aesthetic improvement after revision surgery. However, a subset required further interventions, underscoring the persistent challenge of managing secondary deformities in American populations. (15) A review from the University of California, Davis, discusses the prevalence and complexity of secondary cleft lip and nasal deformities in the United States. It emphasizes that secondary nasal deformities are frequent and often require patient-tailored surgical approaches due to anatomical variability and scarring from previous surgeries. The review also notes the lack of standardized protocols for timing and extent of secondary rhinoplasty, reflecting ongoing debate among American surgeons. (16)

A study from a Nigerian craniofacial center, which was retrospective, documented the prevalence of secondary deformities among patients presenting for revision surgery. The study noted that while the prevalence of secondary lip and nose deformities is significant, resource limitations and late presentation often complicate management and worsen the severity of outcomes. The Pennsylvania lip and nose (PLAN) score was used. (7)

A hospital-based study in Kenya analyzed the prevalence of secondary lip and nose deformities. The findings indicated a lower prevalence compared to global averages but highlighted that secondary deformities, More than half of the subjects (59.4%) had a secondary lip abnormality, when present, often require complex surgical intervention due to scarring and tissue deficiencies.(3)

# 3 Objective

## General Objective

To determine the prevalence and patterns of secondary cleft lip and nasal deformities following primary lip repair in patients treated at Y12HMC college from January 2019 to December 2024.

## Specific Objective

- To identify the prevalence of secondary lip and nose deformities in patients who had primary lip repair at Yekatit 12 Hospital from 2019 to 2024.
- To identify and characterize the types of secondary deformities using a standardized scoring system to classify the impact on facial aesthetics and function.

# 4 Methodology

## Study area

Yekatit 12 Hospital Medical College (Y12HMC) was the site of this investigation due to its high patient load and comprehensive cleft care services. One of the first institutions in Ethiopia to offer patients complete cleft care is Y12HMC, which has plastic surgeons, pediatricians, speech therapists, orthodontists, otolaryngologists, dietitians, and social workers on staff.

## Study period

This is a retrospective cohort study conducted between May - November 2025 GC.

## Source population

All patients who underwent primary cleft lip repair was the source population

## Study population

The study population was those cases who underwent primary cleft lip repair at Y12HMC in the years 2019 to 2024 and who came back for follow-up.

## Study design

Facility-based retrospective cross-sectional study design.

## Sample size

202 patients were included in this study.

## Sample size determination

The sample size was determined utilizing the single population proportion under the following assumptions

A proportion of secondary deformity after treatment = 59.4%

a confidence level of 95%

a 5% margin of error

$$\Rightarrow \boxed{n = Z_{\frac{\alpha}{2}}^{2} \cdot \frac{P(1-P)}{d^{2}}}$$

= (1.96)2 x 0.5(1-0.5) = 202

(0.05)2

Following a 10% non-response rate adjustment, the final sample size was 222.

## Sampling technique

The study was conducted at Y12HMC. Since there were 441 patients operated on for cleft lip between 2019 and 2024, 441/222 = 2. The initial participant in the trial was the second individual in the patient registry, followed by every subsequent pair of patients.

Inclusion criteria

Patients who had primary cleft lip repair during the study period

## Exclusion Criteria

Incomplete charts, including information on the outcome after primary cleft lip repair, Patients operated on for cleft lip, but those who had other craniofacial congenital malformations, and patients who were less than 9 months after their repair were excluded.

## Variables

Dependent variable

The dependent variable was the presence of secondary lip or nose deformity.

Independent variable

Patient demographics (age, gender)

Type of primary cleft (unilateral/bilateral, complete/incomplete)

Surgical factors (technique used in primary repair, timing of surgery)

Time elapsed since primary surgery

Presence of associated syndromes or comorbidities

## Data collection methods

It was collected from patients' charts, and data on registry, clinical assessment for those treated for cleft lip, and the presence of secondary lip and nose deformities was assessed using a standardized data abstraction form from previous literature. Individual data were kept anonymous and confidential. The survey was created in English. Two data collectors selected who hold at least a Residency in plastic surgery and nursing. Every day, the principal investigator oversaw the progress and quality. Standardized assessment tools for measuring and classifying deformities ( the PLAN score) was used.

Table A – PLAN Scoring

| PLAN scoring | | |
|---|---|---|
| Lip scoring | Mild | Nearly imperceptible at conversational distance, not requiring any treatments |
| | Moderate | Some lip asymmetry was noted at conversational distance, requiring minor reconstructive procedures |
| | Severe | Significant lip asymmetry, needing complete revision |
| Nose scoring | Mild | Nearly imperceptible at conversational distance, not requiring any treatment. |
| | Moderate | Tip asymmetry is seen mostly on the worm's eye tip, needing rhinoplasty |
| | Severe | Nasal asymmetry seen on anteroposterior view, at conversational distance, crooked nose. Reconstructive rhinoplasty was needed, i.e., a graft may be necessary to achieve correction |

## Operational definitions

Secondary lip and nose deformity: residual or persistent distortions of the lip and nose that remain or develop after primary cleft lip repair.

## Data Quality Control and Management

Data gatherers received training. Five percent of the sample was used for pretesting the questions. After being manually moved to a computer, the gathered data was cleansed. For analysis, the cleaned data was exported to SPSS.

## Data analysis

Data was entered to the Kobo Toolbox Data collection platform Version 3.1, and SPSS version 27 was used for analysis. Descriptive statistics was used to summarize participants' characteristics. Univariable and multivariable logistic regression models were computed to examine the presence of secondary lip and nose deformities and associated socio-demographic and clinical characteristics. All variables with a p-value <0.25 in univariate analysis were considered for inclusion in the final regression models. Crude or adjusted odds ratios (OR) with 95% CI and p-values were used. All p-values <0.05 were considered to be statistically significant.

## Ethical Consideration

Ethical approval was obtained from the Addis Ababa University, School of Medicine. institutional review board (IRB). Written permission to carry out the research was submitted to Yekatit 12 Hospital Medical College. Patient identity was kept anonymous. The principal investigator and the research team only had access to the data.

## Plan for dissemination of results

The result was presented to Addis Ababa University, Surgical Department, Plastic and Reconstructive Surgery unit, after completion of the study. The results will also be disseminated to Yekatit 12 Hospital and will be published in a reputable journal.

# 5 RESULTS

## 5.1 Sociodemographic and clinical characteristics of cleft lip patients at Y12 HMC

A total of 202 patients who underwent primary cleft lip repair and returned for follow-up were included in this study. Of these, 129 (63.9%) were male, and 73 (36.1%) were female, yielding a male-to-female ratio of approximately 1.8:1 **Fig 1**. In terms of cleft type, 107 (52.97%) had unilateral complete cleft lip, 46 (22.77%) had unilateral incomplete cleft lip, 43 (21.29%) had bilateral complete cleft lip, and 6 (2.97%) had bilateral incomplete cleft lip **Fig 2**.

The median age at assessment was 3 years with an interquartile range (IQR) of 2 years (IQR: 2–4 years), minimum age of 1 years, and maximum age of 20 year. The median age at primary repair was 5 months with an interquartile range (IQR) of 8 months (IQR: 4–12 months), minimum age of 3 month, and maximum age of 199 months.

## 5.2 Perioperative detail clinical profiles of cleft lip patients at Y12 HMC

Regarding the surgical technique performed, 193 (95.5%) of the patients underwent repair using the Millard technique, while 9 (4.5%) underwent repair using the Fischer technique.

Vermillion continuity was intact in 177 (87.6%), minor disruption was found in 16 (7.9%), and severe disruption was noted in 9 (4.5%). Notching deformity was absent in 150 (74.3%), mild in 41 (20.3%), and severe in 11 (5.4%). Mucosal excess was present in 58 (28.7%), while 144 (71.3%) exhibited no excess. Scar quality was imperceptible in 19 (9.4%), visible but flat in 100 (49.5%), and hypertrophic or keloid in 83 (41.1%) Lip symmetry was observed in 129 (63.9%), mild asymmetry in 50 (24.8%), and severe asymmetry in 23 (11.4%). Philtrum alignment was normal in 132 (65.3%), mildly deviated in 46 (22.8%), severely deviated in 7 (3.5%), and either too narrow or too wide in 17 (8.4%). Overall lip deformity grading showed 25 (12.4%) without deformity, 51 (25.2%) with mild deformity, 85 (42.1%) with moderate deformity, and 41 (20.3%) with severe deformity **Table 1 A**.

Primary rhinoplasty was performed in 75 (37.1%) of patients, while 127 (62.9%) did not undergo primary nasal correction. Overall nasal deformity grading indicated 35 (17.3%) without deformity,

57 (28.2%) with mild deformity, 44 (21.8%) with moderate deformity, and 66 (32.7%) with severe deformity **Table 1 B**.

## 5.3 Postoperative surgical outcomes of cleft lip repair of patients at Y12 HMC

Alar base position was symmetrical in 172 (85.1%), mildly distorted in 29 (14.4%), and severely distorted in 1 (0.5%). Nostril symmetry assessment showed 72 (35.6%) symmetric, 71 (35.1%) mildly asymmetric, and 59 (29.2%) severely asymmetric or stenotic. Columella appearance was normal in 83 (41.1%), shortened in 80 (39.6%), and severely shortened or deviated in 39 (19.3%). Parent-reported satisfaction regarding postoperative appearance showed the following: Lip outcome: 130 (64.4%) satisfied, 62 (30.7%) very satisfied, 4 (2.0%) neutral, and 6 (3.0%) dissatisfied. Nasal outcome: 128 (63.4%) satisfied, 62 (30.7%) very satisfied, 8 (4.0%) neutral, and 4 (2.0%) dissatisfied **Fig 3.**

## 5.4 Binary logistic regression analyses of Cleft lip patients at Y12 HMC

Univariate and multivariate logistic regression analyses were conducted to assess predictors of postoperative lip deformity, nasal deformity, lip revision, and nasal revision. Statistical significance was determined using p-value < 0.05, and 95% confidence intervals (CI) were used to represent the precision and direction of association

Lip deformity: Mucosal excess ($p = 0.02$) and scar quality ($p = 0.00$) were statistically significant predictors in regression analysis **Fig 4**. A p-value < 0.05 indicates a statistically meaningful association, while the CI would specify effect estimate boundaries if presented **Table 2**. Nasal deformity **Fig 5.** Type of primary cleft ($p = 0.007$), age at primary repair ($p = 0.044$), primary rhinoplasty ($p = 0.013$), nostril symmetry ($p = 0.001$), and columella condition ($p = 0.00$) showed statistically significant association. A CI that does not cross 1.0 would indicate a reliable directional effect **Table 2**.

Need for lip revision: Overall lip deformity ($p = 0.00$) showed statistically significant association in regression analysis **Table 3**. Need for nasal revision: Primary rhinoplasty ($p = 0.05$), alar base position ($p = 0.033$), and overall nasal deformity ($p = 0.00$) predictors **Table 3.**

Figure 1- shows sex distribution of congenital cleft deformity in Yekatit-12 Hospital from 2019-2024 GC

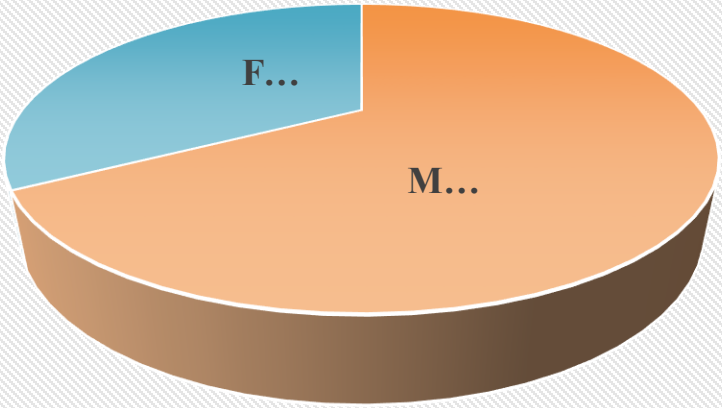



Figure 2- shows Types of deformity distribution of congenital Cleft lip deformity in Yekatit-12 hospital from 2019-2024 GC

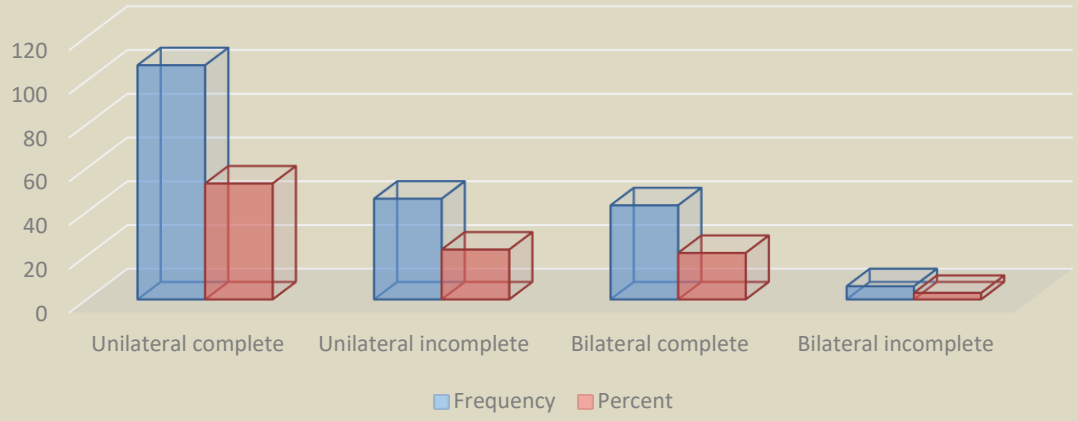


Figure 3- shows parent satisfaction of Nose and Lip apearance after Cleft Lip repair

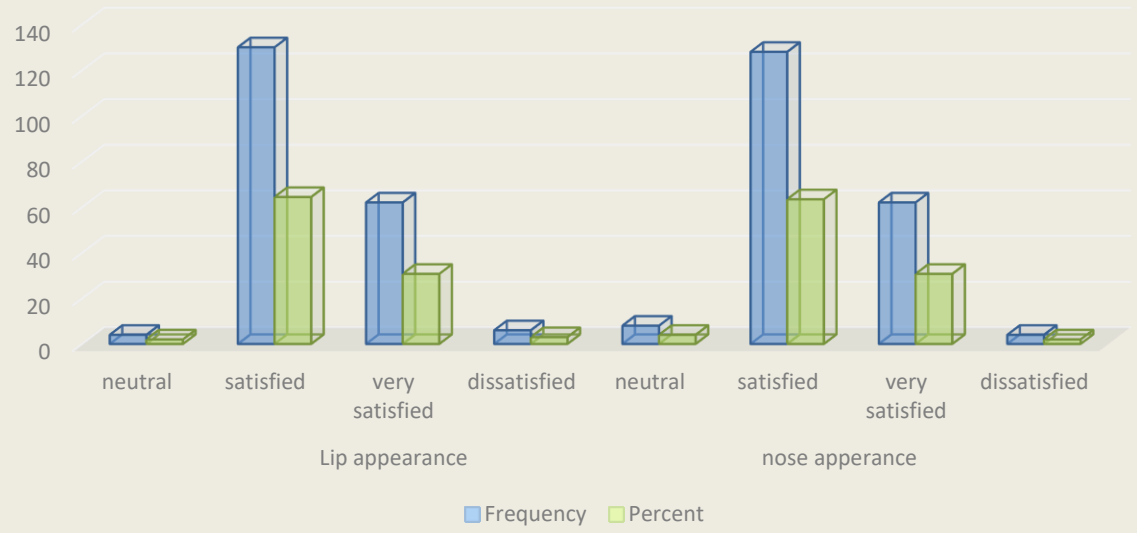
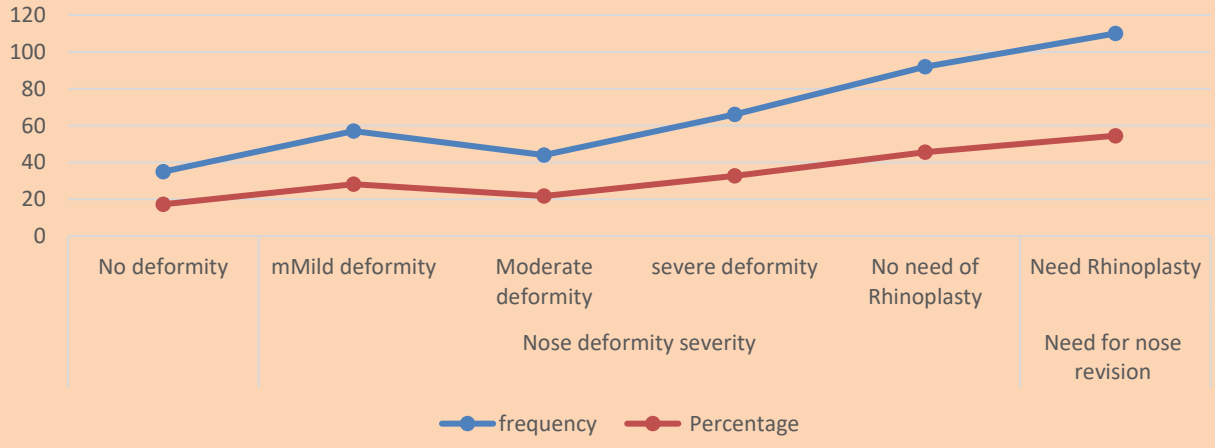



**Figure 4- shows Severity of lip deformity vs need of revision over time after cleft lip repair**



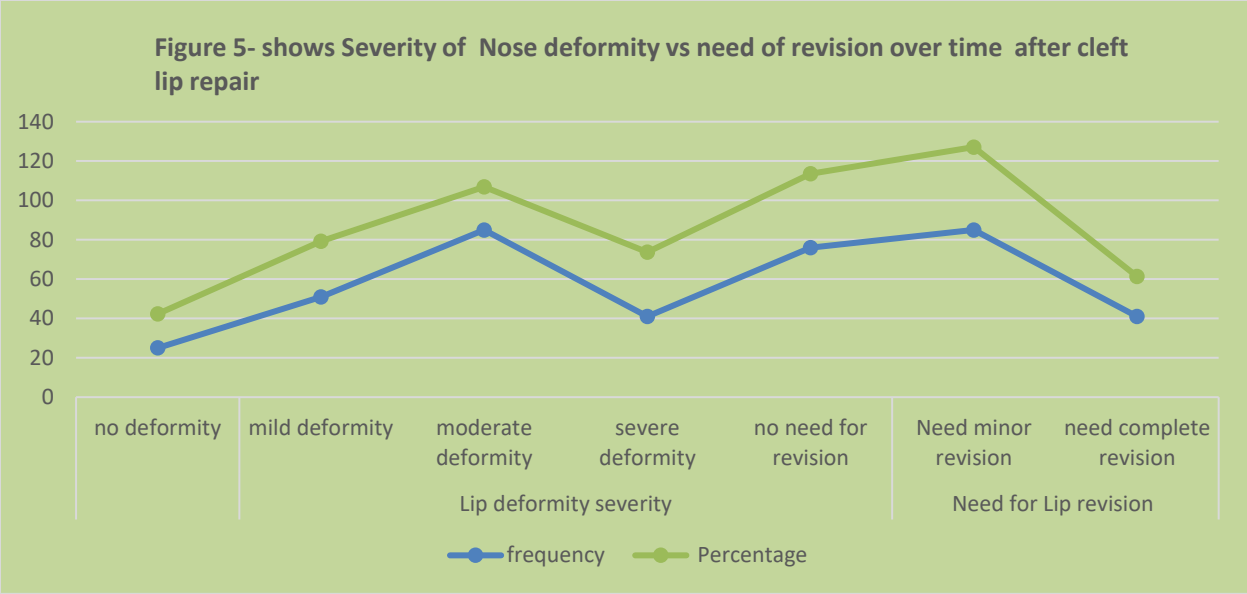



*Table 1 A) shows postoperative lip examination findings*

| Variables | Categories | Frequency | Percent |
|---|---|---|---|
| Vermillion continuity | intact | 177 | 87.60% |
| | minor disruption | 16 | 7.9% |
| | severe disruption | 9 | 4.5% |
| Notching deformity | absent | 150 | 74.3% |
| | mild | 41 | 20.3% |
| | severe | 11 | 5.4% |
| Mucosal Excess | absent | 144 | 71.3% |
| | present | 58 | 28.7% |
| Scar quality | imperceptible | 19 | 9.4% |
| | visible but flat | 100 | 49.5% |
| | hypertrophic/keloid | 83 | 41.1% |
| Symmetry | symmetric | 129 | 63.9% |
| | mild asymmetry | 50 | 24.8% |
| | severe asymmetry | 23 | 11.4% |
| | normal | 132 | 65.3% |
| Philtrum alignment | mild deviation | 46 | 22.8% |
| | severe deviation | 7 | 3.5% |
| | too narrow/wide | 17 | 8.4% |
| Lip deformity degree | no deformity | 25 | 12.4% |
| | mild deformity | 51 | 25.2% |
| | moderate deformity | 85 | 42.1% |
| | severe deformity | 41 | 20.3% |

*Table 1 B) shows postoperative nasal examination findings*

| Variables | Categories | Frequency | Percent |
|---|---|---|---|
| Alar base | same level | 172 | 85.1% |
| | mild distortions | 29 | 14.4% |
| | severe distortions | 1 | 0.5% |
| Nostril Symmetry | symmetric | 72 | 35.6% |
| | mild asymmetry | 71 | 35.1% |
| | severe alar collapse/stenosis | 59 | 29.2% |
| Columella | normal length | 83 | 41.1% |
| | shortened | 80 | 39.6% |
| | severe deviation and shortening | 39 | 19.3% |
| Nose deformity degree | no deformity | 35 | 17.3% |
| | mild deformity | 57 | 28.2% |
| | moderate deformity | 44 | 21.8% |
| | severe deformity | 66 | 32.7% |

Table 2 shows a binary logistic regression analysis of the degree of lip and nose deformity for patients' cleft lip repair

| **outcome** | **categories** | **B** | **S.E.** | **Wald** | **df** | **Sig.** | **Exp(B)** | **95% C.I.** | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **Lower** | **Upper** |
| **Degree of Lip Deformity** | | | | | | | | | |
| | Vermillion continuity | 0.697 | 0.964 | 0.523 | 1 | 0.469 | 2.009 | 0.304 | 13.291 |
| | Notching deformity | 19.12 | 3753.3 | 0.00 | 1 | 0.996 | 2E+08 | 0 | . |
| | Mucosal excess | 2.248 | 0.964 | 5.437 | 1 | **0.02** | 9.47 | 1.431 | 62.661 |
| | Scar Quality: | 2.51 | 0.665 | 14.24 | 1 | **0.00** | 12.299 | 3.34 | 45.287 |
| | Symmetry | 18.73 | 2897.6 | 0.00 | 1 | 0.995 | 1.36E+08 | 0 | . |
| | Philtrum alignment | 17 | 2531.1 | 0.00 | 1 | 0.995 | 24165084 | 0 | . |
| Degree of Nose Deformity | | | | | | | | | |
| | **Type of primary cleft** | **-0.915** | **0.337** | **7.387** | **1** | **0.007** | **0.401** | **0.207** | **0.775** |
| | Age at primary repair | -0.033 | 0.017 | 4.055 | 1 | 0.044 | 0.967 | 0.936 | 0.999 |
| | Primary Rhinoplasty | 1.27 | 0.513 | 6.13 | 1 | 0.013 | 3.561 | 1.303 | 9.731 |
| | **Nostril Symmetry** | **1.444** | **0.415** | **12.11** | **1** | **0.001** | **4.239** | **1.879** | **9.563** |
| | Alar Base Position | 0.496 | 0.674 | 0.542 | 1 | 0.462 | 1.643 | 0.438 | 6.16 |
| | **Columella** | **2.763** | **0.432** | **40.99** | **1** | **0.00** | **15.848** | **6.802** | **36.928** |

*Table 3 shows a binary logistic regression analysis of the need for revision of the lip and nose for patients Cleft lip repair was done in Yekatit 12 hospital and medical college from 2019 to 2024 G.C*

| Outcomes | categories | B | S.E. | Wald | df | Sig. | Exp(B) | 95% C.I. | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Lower | Upper |
| **Need for Lip revision** | | | | | | | | | |
| | Type of primary cleft | 0.474 | 0.695 | 0.465 | 1 | 0.495 | 1.606 | 0.411 | 6.271 |
| | Age at primary repair | -0.002 | 0.028 | 0.005 | 1 | 0.943 | 0.998 | 0.946 | 1.053 |
| | Repair technique | -1.565 | 4.165 | 0.141 | 1 | 0.707 | 0.209 | 0 | 734.004 |
| | Vermillion continuity | 2.311 | 7.966 | 0.084 | 1 | 0.772 | 10.083 | 0 | 60795417 |
| | Notching deformity | -0.086 | 1.886 | 0.002 | 1 | 0.963 | 0.917 | 0.023 | 37.003 |
| | Mucosal excess | 0.651 | 1.581 | 0.17 | 1 | 0.68 | 1.918 | 0.087 | 42.488 |
| | Scar Quality: | -1.511 | 1.455 | 1.079 | 1 | 0.299 | 0.221 | 0.013 | 3.82 |
| | Nostril Symmetry | 0.446 | 1.438 | 0.096 | 1 | 0.756 | 1.562 | 0.093 | 26.189 |
| | Philtrum alignment | 0.185 | 0.914 | 0.041 | 1 | 0.839 | 1.204 | 0.201 | 7.221 |
| | **Overall Lip deformity** | **8.361** | **2.265** | **13.63** | **1** | **0.00** | **4276.693** | **50.508** | **362125** |
| **Need for Nose revision** | | | | | | | | | |
| | Type of primary cleft | -0.561 | 0.472 | 1.416 | 1 | 0.234 | 0.571 | 0.226 | 1.438 |
| | Age at primary repair | -0.018 | 0.026 | 0.455 | 1 | 0.50 | 0.982 | 0.933 | 1.035 |
| | Primary Rhinoplasty | 1.525 | 0.777 | 3.854 | 1 | 0.05 | 4.597 | 1.002 | 21.085 |
| | Nostril Symmetry | 0.075 | 0.624 | 0.014 | 1 | 0.904 | 1.078 | 0.317 | 3.665 |
| | **Alar Base Position** | **-1.881** | **0.884** | **4.525** | **1** | **0.033** | **0.152** | **0.027** | **0.862** |
| | Columella | 0.688 | 0.659 | 1.091 | 1 | 0.296 | 1.99 | 0.547 | 7.243 |
| | **Overall Nose deformity** | **3.764** | **0.698** | **29.1** | **1** | **0.00** | **43.112** | **10.983** | **169.225** |

# 6 DISCUSSION

More than half of clefts have lip involvement. (9) Although these statistics describe primary clefts, secondary cleft lip and nasal deformities are well-recognized complications following primary repair. Their exact global prevalence is not separately documented, but multiple studies confirm that secondary deformities frequently occur and often require revision surgery. (10)

A substantial retrospective study involving 92 patients with bilateral cleft lip nasal abnormalities revealed considerable postoperative enhancements, validating a restoration of nasal morphology towards normalcy post-secondary rhinoplasty.(11) Similarly, studies consistently report that secondary nasal deformities—including septal deviation, nasal tip malformation, and alar cartilage malposition—are common and represent major reconstructive challenges.(10)

The severity of secondary nasal deformity patterns differs around the world. Secondary cleft nasal deformities are most common and severe in East and Southeast Asia, especially in the Philippines, Vietnam, China, and Cambodia. (12) Middle Eastern and North African populations fall in between, with African populations typically exhibiting the lowest prevalence and severity. (16) These differences are believed to be influenced by both genetic and environmental factors. (12) The high frequency of secondary deformities in Asian populations was further demonstrated by a Taiwanese study that included 92 patients having secondary open rhinoplasty. [11]

In Pakistan, a 2012 study of 189 patients with secondary unilateral cleft lip abnormalities identified unfavourable scars, short lip, and vermilion notch as the most common secondary deformities. (6) A European case report and literature review emphasized the iatrogenic contribution of primary surgery to secondary deformities and stressed the importance of meticulous technique. (13) Moreover, certain studies indicate secondary deformity rates ranging from 35% to 85%, contingent upon the population and definitions employed. In North America, an analysis of 219 patients revealed that secondary nasal deformities were prevalent, with 76% of patients experiencing substantial improvement following secondary surgery, although some necessitated further interventions. Another American review highlighted the complexities associated with managing secondary abnormalities, especially due to anatomical heterogeneity and scarring, and noted the lack of defined surgical methods.(16)

African studies also document a significant burden of secondary deformities. A Nigerian craniofacial center reported a notable prevalence of secondary cleft lip and nose deformities, utilizing the PLAN score to assess revision needs. (7) A hospital-based study in Kenya found that 59.4% of subjects had secondary lip abnormalities requiring complex interventions. (3)

The present study from Y12 HMC aligns with these global patterns while highlighting region-specific findings. Among the 202 patients evaluated after primary cleft lip repair, males predominated (63.9%), consistent with global data. The majority had unilateral clefts (75.7%), similar to international trends. The median age at primary repair was 5 months, with a wide range (1–199 months), reflecting delayed interventions in some patients—a factor known to increase secondary deformities. (10)

Millard repair was used in 95.5% of cases, comparable with its worldwide dominance as the standard repair technique. However, secondary lip deformities were common: mucosal excess (28.7%), notching deformity (25.7%), lip asymmetry (36%), and hypertrophic or keloid scars (41.1%). These findings are comparable with reports from Pakistan (6) and African cohorts (3,7), where scarring and tissue deficiency frequently contribute to suboptimal outcomes. Overall, 62.4% of our patients had moderate to severe lip deformities, falling within the widely reported global range of 35–85%. (14)

Nasal deformities were also highly prevalent. Only 17.3% had no nasal deformity, while 32.7% had severe deformities in this study. Nostril asymmetry (64.3%) and columella shortening/deviation (58.9%) were particularly common. These results resemble severity patterns seen in Asian and African populations, where limited access to primary nasal correction and scar-related contracture are major contributing factors. (10,12) In our cohort, only 37.1% underwent primary rhinoplasty, which may partly explain the high rates of nasal abnormalities.

Despite the objectively high prevalence of deformities, parental satisfaction was high, with 94–95% expressing satisfaction with lip and nasal outcomes. This dissociation between clinical findings and caregiver perception has been documented in multiple settings, including North America and Asia. (11,15)

Regression analyses identified key predictors of adverse outcomes. Mucosal excess and scar quality were significant predictors of lip deformity, consistent with global evidence that soft-tissue

imbalance and scarring drive secondary lip abnormalities. (6,10) Predictors of nasal deformity included cleft type, age at primary repair, presence of primary rhinoplasty, nostril symmetry, and columella condition—all of which have been similarly reported in international literature. (11,12,15)

Predictors of revision needs also aligned with global patterns: overall lip deformity predicted lip revision, while primary rhinoplasty, alar base position, and overall nasal deformity predicted nasal revision. These findings reinforce the importance of timely intervention, precise primary repair, and structured follow-up. (10,14–16)

Overall, this study demonstrates that secondary cleft lip and nasal deformities represent a significant clinical burden at Y12 HMC, comparable to reports from Asia, Africa, Europe, and North America. The high prevalence of moderate-to-severe deformities highlights the need for improvements in surgical timing, technique refinement, and broader availability of primary nasal correction to reduce long-term complications.

# 7 STUDY LIMITATIONS

The data used for this research were collected retrospectively from patients' charts, and patients were evaluated at the cleft OPD. It is acknowledged that some information was missing. It would also have been useful to have patient-reported satisfaction and outcomes included in this study.

# 8 CONCLUSION

This study shows that secondary cleft lip and nasal deformities are common among patients treated at Y12 HMC, with more than half presenting moderate to severe abnormalities despite primary repair. Lip issues such as mucosal excess, asymmetry, and hypertrophic scars, as well as nasal deformities including nostril asymmetry and columella shortening, were prominent findings. Limited use of primary rhinoplasty and delayed repair in some patients contributed to these outcomes.

Regression analyses identified mucosal excess, scar quality, cleft type, timing of primary repair, and primary rhinoplasty as key predictors of postoperative deformities and revision needs. Although parental satisfaction remained high, the results highlight the importance of timely intervention, meticulous surgical technique, and improved access to comprehensive cleft care to minimize secondary deformities and enhance long-term outcomes.

# 9 RECOMMENDATIONS

Based on the high rate of moderate to severe postoperative lip and nasal deformities, I recommend early and timely primary cleft lip repair to minimize age-related complications, routine incorporation of primary rhinoplasty—especially for unilateral clefts—to improve long-term nasal symmetry, and strengthening of surgical training with standardized cleft repair protocols that emphasize precise muscle alignment, mucosal handling, and scar-prevention techniques to reduce the need for future revision surgeries.

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# Annex

# Questionnaire

## I. Patient Demographics

1. Patient ID:
2. Age at assessment: _____years
3. Sex: ☐ Male ☐ Female
4. Age at primary repair: ___ Years ___ months
5. Type of primary cleft:
   ☐ Unilateral cleft lip (Left/Right)
   - o Complete o Incomplete

   ☐ Bilateral cleft lip
   - o Complete o Incomplete

## II. Surgical History

6. Primary repair technique:
   - Lip repair: ☐ Millard II ☐ Tennison-Randall

     ☐ Fischer ☐ Mohler ☐ Manchester ☐ Other _____
7. Primary Rhinoplasty
   ☐ Done ☐ Not done If done,

   ☐ open ☐ Closed

## III. PLAN Scoring for Lip Deformity

***(Rate each parameter at conversational distance)***
8. Lip Appearance:

- Vermilion continuity: ☐ Intact (Good) ☐ Minor disruption (Fair) ☐ Severe disruption (Poor)
- Notching/Whistling deformity: : ☐ Absent (Good) ☐ Mild (Fair) ☐ Severe (Poor)
- Mucosal excess: ☐ Absent (Good) ☐ Present (Fair/Poor)

9. Scar Quality:
   ☐ Imperceptible (Good) ☐ Visible but flat (Fair) ☐ Hypertrophic/Keloid (Poor)

10. Symmetry:

- Cupid's bow: ☐ Symmetric (Good) ☐ Mild asymmetry (Fair) ☐ Severe asymmetry (Poor)
- Philtrum alignment: ☐ Normal (Good) ☐ Mild deviation (Fair)

  ☐ Severe deviation (Fair) ☐ Too narrow or wide(Poor)

**IV. PLAN Scoring for Nasal Deformity**

11. Nostril Symmetry:
☐ Symmetric (Good) ☐ Mild asymmetry (Fair) ☐ Severe alar collapse/stenosis (Poor)

12. Alar Base Position:
☐ Level (Good) ☐ Mild depression/elevation (Fair) ☐ Severe distortion (Poor)

13. Columella:
☐ Normal length (Good) ☐ Shortened (Fair) ☐ Severe deviation/retraction (Poor)

**VI. Patient-Reported Outcomes**

14. Satisfaction with lip appearance (1–5 scale):
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ *(1 = Very dissatisfied, 5 = Very satisfied)*

15. Satisfaction with nasal appearance (1–5 scale):
1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐

**VII. Provider Notes**

16. **Overall Lip deformity severity:**
☐ None ☐ Mild ☐ Moderate ☐ Severe

17. **Overall Nose deformity severity:**
☐ None ☐ Mild ☐ Moderate ☐ Severe

18. **Need for lip revision:**
☐ None (Good) ☐ Minor procedure (Fair) ☐ Complete revision (Poor)

19. **Need for nose revision:**
☐ None ☐ Rhinoplasty

20. Additional observations: