



**An-Najah National University**  
**Faculty of Graduate Studies**

**CATARACT SURGERY RATE EYE CARE  
CENTERS IN THE OCCUPIED PALESTINE:  
A RETROSPECTIVE STUDY**

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**This Thesis is Submitted in Partial Fulfillment of the Requirements for the Degree of  
Master of Public Health, Faculty of Graduate Studies, An-Najah National University,  
Nablus - Palestine.**

**2022**

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## **Dedication**

To my **wonderful mum and dad**, for their endless real love, real support, much trust and giving. Even universities cannot teach me what you have taught me, I am at a loss for words to express my affection and gratitude. It is all because to you that I am where I am today.

To my amazing and real **sisters and friends** who believed in me and gave me such real love, I am grateful that we can share good and bad things and moments without fair of being judged.

To the joyful times spent with my **friends in the family**.

To all of the **real things** in my life, I dedicate this thesis

## **Acknowledgements**

First, **I thank God** for giving me everything i asked for, and even a lot of blessings that i did not ask. For giving me this opportunity to achieve this work, for his endless giving, I thank God.

Thanks to Ophthalmologists, Cataract Surgeons, Nurses, and Ophthalmology surgical hospitals mangers for their support and participation in this study.

To all hospital Optometrists for their assistance in facilitating data collection.

I would like to thank my **statistical advisor Hala Al-Labadi, PhD** for her advice and guidance. Moreover, I would like to express my sincere gratitude to **my advisor Liana Al- Labadi, OD** for the support of my study and related research, for her patience, motivation, guidance and knowledge.

To Shatha and Rahaf for filling in for me at work while i was away.

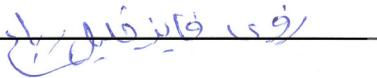
Special thanks to **DR. Yousef Al Shanti** for his assistance with the proposal.

## **Declaration**

I, the undersigned, declare that I submitted the thesis entitled:

### **CATARACT SURGERY RATE EYE CARE CENTERS IN THE OCCUPIED PALESTINE: A RETROSPECTIVE STUDY**

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

**Student's Name:** \_\_\_\_\_ 

**Signature:** \_\_\_\_\_ 

**Date:** \_\_\_\_\_ 

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# CATARACT SURGERY RATE EYE CARE CENTERS IN THE OCCUPIED PALESTINE: A RETROSPECTIVE STUDY

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## Abstract

**Introduction:** Nearly half of vision impairment and blindness among elderly people are due to cataract, but fortunately, this decreased vision is reversible as advancing technology allows for cataract surgery to be conducted with high accuracy and precision. Despite the fact that cataract is easily treated, cataract was reported to be the major cause of blindness in Occupied Palestine among people over the age of 55. Cataract surgery rate is one of the indicators used to measure cataract service delivery in countries. It is a quantifiable measure of the cataract surgical services accessibility to those who need it. The World Health Organization has set a cataract surgery rate of 3,000 per million people per year as the minimum rate required to eliminate blindness due to cataract. As there is limited information on the cataract surgery rate in Occupied Palestine, **them this study has sought to measure the cataract surgery rate in Occupied Palestine.**

**Methods:** A retrospective records review study was conducted in 2019 and 2020 to determine the cataract surgery rate at all cataract surgery hospitals and medical centers in Occupied Palestine.

**Results:** Cataract surgery rate decreased from 2,297 operations per million in 2019 to 1,885 due to corona virus pandemic in 2020. Out of 211 cataract-operated eyes with corrected visual acuity, 93.84% of them achieved good visual acuity ( $\geq 6/18$ ), 5.21% of them had borderline acuity ( $< 6/18-6/60$ ). Only 0.95% had poor visual acuity ( $< 6/60$ ).

**Conclusion and Recommendations :** Cataract surgery rates in 2019 and 2020 were lower than the minimum rate set by the World Health organization. Therefore, there is a need to increase cataract surgery rate across the country. Visual outcomes of cataract surgery have improved in Occupied Palestine and have been found to be very close to World Health Organization satisfactory outcomes.

**Keywords:** Cataract; cataract surgery; cataract surgery rate; cataract surgery outcome; visual impairment; cataract blindness.

# **Chapter One**

## **Introduction**

### **1.1 Background**

Cataract is a clouding of the normally transparent lens of the eye that impairs normal vision depending on its size and location (52). Some people's sight is only slightly affected, while others may lose their vision quickly. The exact type of cataract will determine how it progresses. Cataract blindness is usually progressive. The patients' vision becomes increasingly cloudy and blurry, as if they are looking through fog. Contrasts and colors become less distinct as time passes. Some patients may become extremely sensitive to sunlight or glare and driving is more difficult, especially at night. Moreover, poor vision increases the risk of falling and injuring yourself (66).

Patients who wear spectacles can sometimes suddenly see better without them. This is due to changes in their refractive power, which affects their ability to focus on objects at various distances. However, enhanced vision without spectacles does not last long (66).

Several epidemiologic studies have found that age, sex, and race are all risk factors for cataract formation (52). Other risk factors for cataract have been identified in previous studies, including diabetes, smoking, high body mass index, myopia, sunlight exposure, female gender, steroid use, and pseudoexfoliation in the anterior segment of the eye (67).

Cataracts are classified into three main types: nuclear cataract, cortical cataract, and posterior sub-capsular cataract. Nuclear cataracts start with a gradual yellowing and hardening of the nucleus, and this yellowing and hardening will spread to the other layers of the lens over time, and the condition will worsen slowly. Moreover, these cataracts have a greater impact on the ability to see distant objects than on the ability to see nearby objects (66).

In addition to blurred vision, cortical cataract causes problems with night driving, glare, contrast, and depth perception. However, diabetics are at a higher risk of developing cortical cataracts. Posterior sub-capsular cataracts can impair reading by causing glare around lights and halo effects. Furthermore, people with diabetes, steroids, and extreme myopia can develop this type of cataract. Posterior sub-capsular cataracts are more

prevalent in younger people and progress quickly with symptoms appearing within months (66).

Cataract has been associated with many systemic diseases mainly hypertension (HTN), diabetes mellitus (DM), chronic kidney disease and autoimmune disease. Modifiable risk factors include ultraviolet light exposure, alcohol consumption and corticosteroid use (52). Cataract is a major cause of visual impairment in diabetic patients as the incidence and progression of cataract increases. Diabetes patients have a higher risk of cataract formation than the general population. Longer duration of diabetes mellitus, increased level of glycated hemoglobin (HbA1c), age, proteinuria, severity of diabetic retinopathy, and diabetes treatment were all considered as risk factors, posterior sub-capsular cataract and cortical cataract found to be associated with diabetes mellitus while nuclear cataract was associated with increased HbA1c level (63).

Diabetic patients who undergo cataract surgery typically experience good outcomes; however, there are some known complications to be aware of, such as post-operative cystoid macular edema, increased posterior sub-capsular opacity and progression of diabetic retinopathy (52).

Cataract is considered to be a major public health problem as it remains to be the leading cause of blindness (1) and the second cause of visual impairment after refractive errors, accounting for nearly 34.47% and 24.04% of all blindness and vision impairment worldwide respectively (2). According to the World Health Organization, one billion people globally suffer from moderate or severe distance vision impairment or blindness. Of them, 88.4 million visually impaired people due to uncorrected refractive errors, and 94 million people globally due to cataract (41).

In the Middle East and North Africa, the number of blind and visually impaired people due to cataract were more than 4.5 million in 2015 (3). A study conducted in the OPT in 2010 reported that 55% of the blindness in the  $\geq 50$  years age group in the country was due to cataract (4).

In 2020, an estimated 15.2 million individuals worldwide aged 50 and more were blind due to cataract, with another 78.8 million suffering from vision impairment owing to

cataract. Since 2000, there has been a 29.7% increase in cases of blindness due to cataract and a 93.1 percent increase in cases of vision impairment (41).

Blindness due to cataract can be prevented through cost-effective surgical interventions that should be easily accessible to those who need it, and ultimately result in restoring vision and improving quality of life (5). Moreover, cataract is the most frequently performed surgical procedure providing significant, long-term, and cost-effective improvements in the quality of life for patients of all ages (17).

Cataract removal techniques include Phacoemulsification, Extra Capsular Cataract Extraction (ECCE), and Manual Small Incision Cataract Surgery (MSICS). However, phacoemulsification is the most commonly used cataract surgery technique worldwide (53).

Phacoemulsification was a huge benefit to the medical community because it allowed the cloudy lens to be emulsified through a small incision of 2-3 mm, resulting in good visual outcomes. The gold standard for cataract extraction remains the basic phacoemulsification technique, despite numerous modifications to the current method. It entails making two side port incisions of at least 2-3 clock hours on either side of the primary wound, as well as a superior or temporal clear corneal incision of 2-3 mm. The cloudy lens is emulsified and aspirated from the primary wound using an ultrasonic probe in the trench. Modern cataract surgery was revolutionized by the development of small incisions because they were neutralize astigmatism, self-healing, anatomically better wound-strength, and had a lower incidence of developing complications. Additionally, this gave rise to the idea of foldable intraocular lenses, which can be implanted in the capsular bag through a smaller wound (68).

Although both manual small incision extracapsular cataract procedure and phacoemulsification achieve perfect visual outcomes with low complication rates, manual small incision extracapsular cataract operation is noticeably requires less technology, quicker and less expensive. The preferred method for cataract operation in developing countries may therefore be manual small incision extracapsular cataract surgery (70).

An essential part of cataract surgery, as with all surgical procedures, is anesthesia. The delivery of cataract surgery has undergone significant changes, and as a result, anesthesia

for cataract surgery has developed over the past 20 years.

The delivery of anesthesia has evolved from general anesthesia to local anesthesia, including peribulbar, sub-tenon and retrobulbar, to topical anesthesia as a result of the inescapable changes. A good anesthesia technique should ensure the patient's comfort both during and after surgery. In general, the decision of anesthesia modality must be made on an individual basis for each patient and surgeon. Worldwide, there is an apparent growing trend toward the use of local anesthesia during cataract surgery instead of general anesthesia (32).

After cataract removal, the eye lens is replaced with an artificial intraocular lens (IOL) that resembles a naturally transparent lens. Monofocal and multifocal intraocular lenses are the most common types of intraocular lenses. However, when compared to standard IOLs or monofocal lenses, multifocal IOLs result in better uncorrected near vision and a greater proportion of patients achieving spectacle independence, but a higher risk of unwanted visual phenomena such as halos around light and glare (54).

Cataract can result in moderate vision impairment (less than 6/18 to 6/60), severe vision impairment (less than 6/30 to 3/60), or blindness (less than 3/60). It is more important to think about the number of eyes rather than the number of people who need surgery because people can have unilateral or bilateral cataracts (69).

After cataract operation for the first eye, many patients find that their previously minimally symptomatic 20/30 fellow eye is no longer sufficient in comparison to the new pseudophakic eye. The advantages of cataract surgery for the first eye appear to have altered our patients' perceptions of their condition and how well the visual function in the other eye. Furthermore, this is evidenced by the fact that the cataract surgery in the second eye has significantly increased and now makes up about 40% of all cataract surgeries, according to most surveys (11).

Compared to surgery on just one eye, bilateral cataract surgery is more affordable, increases patient satisfaction, and produces better visual outcomes. In the last years, Olmsted County residents have seen a doubling of the rate of cataract surgery in the second eye within the first three months after the surgery in the first eye (60% vs. 28%), with 86% of residents now having cataract surgery for the second eye within two years of the operation in the first eye. This may be due to the documented benefits of bilateral

cataract surgery (11).

The aim of a 25% reduction in avoidable visual impairment from 2010 to 2019 set by the World Health Assembly Global Action Plan was fulfilled for cataract blindness but not for vision impairment. Longevity and global population growth, on the other hand, have more than offset drops in prevalence, leaving more persons blind and visually impaired due to cataract than ever before, thus, the global mobilization of resources for cataract treatment is required (41).

Cataract surgery is still one of the most commonly performed procedures in many countries, providing major improvements in the quality of life for patients of all ages. Worldwide, the need for cataract surgery has been growing as a result of aging populations and rising life expectancy. As a result, the increased need for cataract surgeries presents major financial difficulties for nations in terms of health budgeting and the cost of disease (5).

The World Health Organization Global Action Plan adopted quantifiable measures for the delivery of cataract surgical services which are: cataract surgical rate (number of cataract operations performed per year per one million population) and cataract surgical coverage (number of people with cataract and eligible for cataract surgery over the number of people undergone cataract surgery in one or both eyes (42). Fortunately, reversible blindness due to cataract can be reduced by increasing the cataract surgery rate.

Cataract surgical rate (CSR) is defined as “the number of cataract operations per million population per year”, and it is a quantifiable measure used to help eliminate cataract blindness by assessing the accessibility of patients to cataract surgical services (6, 7). Moreover, CSR is used as a proxy indicator of a nation's accessibility to cataract services (5).

The CSR may be affected by a number of factors, such as cultural barriers, education, decreased use of the services that are offered as a result of patients' fear about the surgery itself and the visual outcomes. The number and accessibility of ophthalmologists, the level of visual acuity, and any other criteria that may be used to decide whether or not to perform cataract surgery are all supply-end determinants. Furthermore, the cataract surgery rate varies significantly from nation to nation and even within nations (5).

CSR is affected by the country's extent of economical development, human resources, infrastructures, medical and social factors (8), the incidence and prevalence of cataract, patient demand and service delivery (17).

Three factors affect the number of cataract surgery: population age dynamics (age >60 years), the visual acuity threshold used as a surgical indication, and the ratio of those who are eligible for cataract surgery to those who actually undergo cataract surgery. Generally, Ageing will keep cataract surgeons busy as the rate of population aging outpaces the rate of supply of trained ophthalmologists (42).

The adoption of refractive cataract operation using a safe, painless, and reliable surgical procedure with minimal postoperative care, while riding high on technology and trends, has duly surpassed patient expectations and has fueled the demand for cataract surgery. The threshold for cataract operation has decreased as a result of this phenomenon. Moreover, Cataract surgeons will be kept busy as patient demand rises. The problems are made worse by the imbalanced distribution of ophthalmologists between urban and rural areas and the inadequate training of residents in cataract surgery (lack of adequately trained workforce) (42).

In the United States, 40% of first-year residents have the opportunity to perform a primary surgery that year and 75% of first-year residents assist in the operating room; only 38% of residents perform their first surgery in their second year of residency. However, one of the factors influencing the cataract surgery rate is the number of qualified residents (16).

According to World Health Organization (WHO), the lowest acceptable CSR needed to eliminate blindness due to cataract is 3000 operations per million population per year (9), and the global target is 2000-5000 per million population per year (PMPY)(10). In developed nations, the CSR is high comparing to lowest acceptable rate, however, in low income countries, the CSR remains lower than the minimum acceptable rate recommended by World Health Organization.

To reduce the backlog (or waiting list) for those who need to receive cataract surgery, the number of cataract operations performed each year must at least equal the incidence of operable cataract (11). CSR has a direct relationship with availability of services and facilities of cataract surgery, and according to the WHO the major barriers for cataract

surgery uptake include poor quality of services, lack of awareness, high cost treatment, and poor accessibility especially in low income countries. By overcoming these barriers, promoting cataract surgery services, and developing methods and data for assessment of cataract services, the CSR will rise and preventable blindness rates would be reduced (9).

Lower visual thresholds for surgery are, predictably, associated with higher surgery rates. Cataract surgery rates increased approximately 5-fold in Australia when the visual impairment threshold was reduced from less than 20/200 to less than 20/30. However, Snellen acuity alone is a functionally insufficient measure of visual function, and other quantifiable elements such as glare and contrast sensitivity contribute to patients' visual discomfort and dissatisfaction (11).

Some reasons for the low cataract surgery rate in low and middle-income countries on the provider (supply) side include insufficient human resources and poor infrastructure. However, on the Patient side (demand), reasons for a low cataract surgery rate include fear of surgery, difficulty to travel to healthcare facilities, a lack of community awareness (55), and cost of surgery (5).

Today's ophthalmologists can quickly and safely remove a cloudy lens using improved technologies and procedures, and they can reasonably reduce or eliminate spherical and astigmatic error after cataract surgery. Better results, exceeding patient expectations and higher quality of life due to the ability to provide a new, innovative cataract surgery have led to an increase in patient demand for cataract service (11).

In low-income countries, there is gender disparity in access to cataract surgery, with men having higher cataract surgical coverage than women. Generally, women in low-income nations are poorer and have a lesser access to healthcare than men. In Egypt, gender inequity was more marked in the private sector. According to a cross-sectional study done in the Upper Region of Egypt in 2014, women were significantly more likely than men to have cataract. More surgeries were done in men than in women in Egypt in 2014, supporting the hypothesis that the disparity in cataract prevalence results from women's limited access to surgery (15).

In developed nations or high income countries, CSR ranges from 4000 to 10,000 operations per million population per year, and blindness due to cataract is very rare.

Comparatively, the cataract surgery rate typically ranges from 500 to 2000 operations per million population per year across economically developing countries in Latin America and Asia. The CSR was reported to be lower than 500 operations (PMPY) in many African countries (12, 13, 14).

India was successful in increasing its cataract surgery rate, which went from 700 cataract operation per million population per year in about 1981 to 6000 operations per million per year in 2012 (42).

In the Middle East, cataract surgical rate in Pakistan has increased from 2,254 operations per million population per year in 2002 to 5,203 operations (PMPY) in 2019 (56).

In occupied Palestinian territories, the CSR in 2015 was 2117(PMPY) (31). However, in Egypt, the CSR was 3674 operations per million per year in 2014(15), while in Iran, most provinces had a cataract surgery rate more than 3000 operations per million per year in 2010 (16).

## **1.2 Significance of the study**

To our best knowledge, cataract surgery rate in Occupied Palestine has not been reported since 2019, and it is unknown whether current services and cataract surgery outcomes are sufficient or adequate in meeting the needs of the Palestinian population. As poor visual outcomes of cataract surgery in Palestine reported before many years and the results were away from the international standards, the aim of this study is to measure the cataract surgery rate in the Occupied Palestine.

Furthermore, to assess whether the visual outcomes of cataract surgery in Palestine was still behind the acceptable international results or there were an improvement.

### **1.3 Study Objectives**

**Primary objective:** To estimate the cataract surgery rate in the Occupied Palestinian Territories.

**Secondary objectives:**

1. To assess the services and procedures used in cataract removal in Palestine.
2. To assess cataract surgery visual outcomes.

**Research Question**

What is the CSR in the OPT in years of 2019 and 2020

## **Chapter Two**

### **Literature Review**

Pub-Med and Google Scholar databases were used in the literature search using the following keywords: CSR, Global CSR, CSR in Africa, Yemen, Iran, Pakistan, Egypt, Latin America, CSR in Middle-East. Nine articles were found in the literature and assessed. CSR comparisons among different countries were performed for the purpose of this literature review. Literature on CSR has been published in many countries including both developed and developing countries. Although CSR have been reported in the Middle-East, only one literature was found to report CSR in the OPT.

In **the Middle East**, four studies, in Palestine, Iran, Yemen and Egypt reported on the CSR. A cross-sectional descriptive study conducted in 2015 targeting all the centers in Palestine that provides cataract surgery services. The total number of cataract surgeries gathered in the years of 2011 to 2015. By the year of 2015, other data relating to price of cataract surgery, gender type of facility and others were gathered. Phacoemulsification was the most commonly used surgical procedure (73%), which was more common in the West Bank than in Gaza. In governmental centers, the extracapsular cataract extraction technique used in 67% of cataract surgeries. The national CSR has ranged between 1,920 and 2,222 operations per million population per year during the five years from 2011 to 2015. Except for 2014, the CSR was similar in the West Bank and Gaza.

Generally, the cataract surgical rates from 2011 to 2015 show a constant output from government facilities, however the private facility output increased from 2012 to 2014 before declining in 2015. Moreover, high referral rate from governmental facilities found in West Bank. Comparatively, almost cases seen in Gaza handled by government facilities.

In 2015, the CSR for Palestine was 2,117 cataract operations per million population per year. This is a minimum estimate because there was no data from Israeli centers on the number of Palestinian East Jerusalemites who had cataract surgery in their facilities or Palestinians who had cataract surgery in any other country. The study did not assess the visual outcomes of patients undergone cataract surgery (31).

A retrospective study conducted in **Tehran (Iran)**, used surveys to determine the variation in CSR among different provinces during the period of 2006 to 2010. All major and minor centers in Tehran were included in the study except those centers with less than 100 operations per year they were excluded. One week in every season was randomly selected and the number of cataract surgeries in that week was recorded. Sampling was performed over a 5 year period and 4 weeks were selected per year (18).

The number of cataract surgeries performed in those 4 weeks was multiplied by 12.5 to account for the 50 weeks over the specified 5 year period after excluding national holidays. The reported CSR increased from 8011 in 2006 to 12465 in 2010 per one million populations. This is considered a high percentage and this might be partly due to patients from other parts of Iran or neighboring countries going to tehran for their cataract surgery since the centers are known to be well equipped centers with quality services. Results of this study indicated that CSR was found in the public sectors to be lower than the private sectors (18).

Male patients constituted the majority of the patients before the age of 40 while the percentage of the female patients was higher in all age groups after 40 years of age, The highest percentage of cataract surgery was observed in patients who were 71-80 years old, males below age of 40, who were probably more likley to acquire cataract secondary to traumatic events, and females above the age of 40 years probably were more concerned about their health. At least 97% of cataract surgeries were done by phacoemulsification method (18). The study also showed a decrease in hospitalization and an increase in cataract surgery output in the study period. More studies needed to pinpoint the causes of higher CSR in private sectors because private sectors may be overestimates the number of surgeries due to tourism, and serving patients from other provinces(18).

The quality of surgery was not evaluated in this study, thus future studies should be performed to evaluate the status of vision following cataract surgery in Tehran Province to confirm their quality besides their quantity.

In a study conducted in **Egypt** between June and August 2015, all private and public facilities in the country providing cataract surgical services were included and contacted by phone by the research team to obtain information on cataract surgeries performed in 2014. It is unclear from the methodology of this study how the sampling method was

conducted. All hospitals performing eye surgery in three regions representing different geographical areas (Quena, Sharkia, and Fayoum) were visited and a detailed questionnaire of the availability and utilization of resources for cataract surgery was completed by the research team (15).

The CSR in 2014 in Egypt was estimated to be 3674 per million population which was slightly above the 3000 CSR recommended by the WHO criteria. The facilities participating in this study included all providers of cataract surgery in the country which represent 90.6% of eye care facilities. 100% of government and teaching hospitals, and 70% of private sector facilities provided cataract surgery services in Egypt (15).

The private sector was responsible for over 70% of the cataract surgeries in Egypt due to the higher number of private facilities and the higher productivity of doctors in these facilities. There were marked differences in CSR between regions, ranging from 402 in rural areas to 7579 in urban areas. In this study, large cities with higher urban populations, like Cairo, showed higher CSR rates, and this is due to the fact that in low- and middle-income countries (LMICs), the majority if cataract services are offered in urban settings. Phacoemulsification surgery dominated in the private sector at a rate of 85.6%, while it was performed at a lower rate of 41% in the governmental sector, and this was due to the high cost of equipment and consumables related to phacoemulsification. The study found that more surgeries were done in men than in women in Egypt, supporting the hypothesis that the difference in cataract prevalence is a consequence of women's lack of access to surgery (15).

Gender inequity in access to cataract surgery has been shown in low-income settings, with a higher cataract surgical coverage for men than for women. In three regions examined in egypt, cataract surgery was conducted on women in 43% of the cases. In general, women in LMICs are poorer and have less access to health services than men (15).

A retrospective study was used to determine the CSR in **Yemen** 2012, using a standardized questionnaire. The questionnaire was sent to 184 eye units in 2012. The CSR in 2012 was 2473 per million population but and it was not meeting the WHO recommended CSR criteria. They classified the centers by groups: Centers with more than 1,000 cataract surgeries per year were classified as group A; centers with 500–1000

cataract surgeries per year were classified as group B; and centers with less than 500 cataract surgeries per year were classified as group C. The information regarding CSR was collected through hospital administration sources, case records and/or theater data to increase the accuracy of data, and the response rate was 80.7% for the questionnaire (14).

Extracapsular cataract surgery, accounting for 81.9% of cataract surgeries, was still the main technique for performing cataract surgery in Yemen in 2012 (14).

Although the rate of Phacoemulsification surgery has increased over the years from 0.8% in 2003 to 17.9% in 2012, the number of surgeons performing phacoemulsification technique still remains low. The reason for this is the lack of training of ophthalmic personnel in phaco technique and the low number of eye centers with phacoemulsification surgery services. Reasons reported in this study of why CSR was low in Yemen included long distances from surgical centers, cost of surgery to the poor Yemeni people and the lack of public awareness. In addition to the major political and socioeconomic difficulties that Yemen has suffered since 2011 (14).

The authors stated that the main limitation of this study is that they were unable to obtain information of intraoperative and postoperative complications, as well as, the final visual outcome of the surgeries performed (14).

A retrospective study was conducted in **Shanghai** to calculate CSR from 2006 to 2009. Data was gathered by the Eye Disease Prevention Centers in 19 districts twice a year. All cataract surgery units completed a registration form before the 5th day of the next month and the form was then submitted to the Eye Disease Prevention Center in the corresponding region. After data for one year had been collected, a random inspection in 4 regions of the 19 total districts was performed by the Shanghai Eye Disease Prevention & Treatment Center to review the quality of data. CSR was calculated as follows: the CSR equals the number of cataract surgeries in Shanghai (or a district of Shanghai) in a given year divided by its resident population (or population of the district) in that year (in millions) (21).

The CSR in Shanghai increased steadily from 1741 in 2006 to 2210 in 2009 but it is still behind the recommended WHO CSR criteria. Phacoemulsification was the primary technique utilized for cataract removal, and the rate has been rising every year. From 2006

to 2009, the IOL implantation rate was greater than 98%, and more than 86% of patients had a 1st–3rd postoperative day corrected of  $\geq 0.3$ . Post-operative visual acuity is used as an indicator to measure the quality of cataract surgical services (21).

In this study, authors concluded that the visual outcome of cataract surgery was measured using best corrected VA on the 1st–3rd postoperative day, which may not provide insight into the long-term effects of cataract surgery. The authors stated that more detailed data regarding surgical complications should be collected in future studies. Another limitation in this study is that the age distribution pattern in the population was not considered in this analysis because only the data of the registered population who is over 60 years old could be found in the Shanghai Statistical yearbook (21).

A review summarized data collected in **Sweden** by the Swedish National Cataract Register, which contains data pertaining to more than a million cataract surgery procedures, representing 95.6% of the surgeries performed in Sweden during 1992-2009 (22).

Cataract surgery rates in Sweden had stabilized between 2002 and 2009 at 8000 to 9000 procedures per million persons, which was above the 3000 CSR recommended by the WHO criteria. Cataract surgery rates subsequently increased in the county of Stockholm because the country removed the limit on the annual number of cataract surgeries allowed in 2008 in that area. The mean patient age increased from 75.1 in 1992 to 76.2 in 1999 and it decreased to 74.9 in 2009. Capsule complication has been decreased from 2.8% in 2002 to 1.6% in 2009 (22).

There was a slow decrease in the surgery backlog and an increase in the rate of second eye surgery, due to several factors including removal of the limit on the number of the annual cataract surgeries that placed by many of Sweden's 22 counties/regions and the competition were increased for eye care resources from other fields within ophthalmology, specially in the management of other eye diseases such as age-related macular degeneration (AMD) (23).

In **Latin America**, a study was conducted to detect CSR in different countries. Data was collected from 19 countries in south and central america from the world bank and other resources such as the ministry of health for each country. The results showed that most

countries increased their CSR in regional mean of 1420 per million population over a 4 years period, but the actual increases were small. Exceptions were reported in Costa Rica, followed by Cuba, Nicaragua and Venezuela where the increase in CSR was reported to be 53%, 95%, 183% and 83% respectively. This increase met the Vision 2020 goal of eliminating avoidable blindness due to cataract. However, inadequate services, which includes poor surgical outcomes, has been a factor in Latin America, in addition to fear of the surgery or lack of knowledge concerning the surgery (25).

The study had some limitations. First, over the study period they did not have complete data from all countries for each point in time. Secondly, private practitioners were not always willing to share information, which could lead to under- or overestimation in the private sector (25).

Low cataract surgical rate is predicted in Palestine, similar to nearby countries mentioned in appendix 4. Moreover, low-income countries, had low cataract surgery rates, such as Sudan with 289 operations per million per year, Eritrea with 1132 operations, Ukraine with 1222 operations, and Bulgaria with 1195.

Iran is one of the nearby countries to Palestine with a high cataract surgery rate of 6328 operations per million population per year (24, 8), and Bahrain had an average cataract surgical rate of 2175 operations. This annex had been summarized for the most geographically closer countries to Palestine from a comprehensive research of eligible studies that reported on cataract surgical rates without any language restrictions. The literature search was updated regularly and the latest was April 25, 2016.

Several factors affecting CSR including Demographical Factors, such as age, sex and occupation, indeed, the Economic Development, Human Resources, Surgical Infrastructure, and Social Factors are affecting cataract surgery rate in several nations. All these factors are mentioned in detaies in appendix 5.

There are estimates for the cataract surgical rate in various regions of the developed world from 2010 to 2014, where the CSR in North America was reported to be 10000, Western Europe averages around 4000 (10), Australia 8000 and in Japan 8091(5).

All documented studies relieved that the cost and the quality of cataract surgeries are the major indicators to achieve the CSR recommended by the WHO. Table(3) shows an overview of CSR reported worldwide.

Palestine still lags behind as there are limited public health data on the incidence and prevalence of cataract and its overall impact on visual impairment levels, and until now informations about CSR are limited.

**Table 1***CSR in several areas during many years(16, 17, 18, 25-29)*

<b>Countries</b>	<b>Year</b>	<b>CSR</b>
Iran	2000	526
	2005	1331
	2010	6328
Fars	2006	9517
	2007	10,190
	2008	15,186
	2009	10,695
	2010	11,932
Brazil	2005	2448
	2006	2352
	2007	2212
Cuba	2005	1600
	2006	2219
	2007	3125
Mexico	2005	958
	2006	1200
	2007	1138
Argentina	2005	1769
	2006	2100
	2007	2089
Colombia	2005	1189
	2006	1350
	2007	1278
Tehran Province	2006	8011
	2007	8998
	2008	12550
	2009	11881
	2010	12465
Israel	1990	3.5 per 1000 per year
	2014	6.9 per 1000 per year
Sweden	1990	3600
	1992	4500
	2009	9000
UK	1990	2700
China	1991-1996	3802
South Africa	2005	1000
	2010	2000

## **Chapter Three**

### **Materials and Methods**

#### **3.1 Study Design & Setting**

A retrospective records review study was conducted in 2021 and covers the years 2019 and 2020 to determine the CSR among cataract surgery centers in the OPT.

#### **3.2 Study Population & Size**

Any Palestinian of any age received cataract surgery in a cataract surgery center in the OPT in the years of 2019 and 2020 were included in the study. There are 17 hospitals and medical centers for receiving cataract surgery in the OPT, eight medical centers and nine hospitals. The number of cataract surgeries performed at 15 centers in 2019 and 2020 was collected as one private center refused to participate, and one hospital closed its cataract surgery department at the beginning of 2019.

The eight hospitals are: Alia governmental hospital and St John in Hebron, Arabic Association for Rehabilitation in Bethlehem, Hugo Chavez governmental hospital in Ramallah, An-Najah teaching hospital, Rafidia hospital and Arabic hospital in Nablus, and St John in East Jerusalem.

The eight ophthalmology centers are: Al-Arabi center, Al- Russi center, and Hjooj center in Hebron, Dar Eloyon center in bethlehem, Sergy care center, Jerman center, and Basar center in Ramallah&Albereh, and Sergy care in Jenin. However, we only chose hospitals (both private and government) to assess the services and the visual outcomes after cataract surgery as they are more likely to have complete electronic records in comparison to private small centers.

The data were collected in two stages: in stage one, the total number of cataract surgeries in the included 15 hospitals and medical centers was collected in each year for each center. The cataract surgery rate was calculated using the equation shown in (Figure 1).

## **Figure 1**

*Cataract surgery rate equation.*

$$\text{CSR} = \frac{\text{Number of cataract surgeries for all hospitals and medical centers in the given year}}{\text{population of the OPT in the given year}}$$

In stage two, a random sample of patient records from the eight OPT hospitals for the year 2019 were collected and analyzed to evaluate cataract surgery outcomes in the OPT.

### **Sample size and sampling**

A random proportional method was used to select subjects. The following equation (Steven K. Thompson equation) was used to calculate sample size (65).

$$n = \frac{N \times p(1 - p)}{[(N - 1)(d^2 \div z^2)] + p(1 - p)}$$

n = sample size.

z = Standard normal variate (1.96 for 95% confidence level)

p = probability.

d= Absolute error.

N = population size.

We used a standard normal variate of 1.96 and an absolute error of 5%. The number of cataract surgeries in OPT hospitals (N) was 4301 in 2019. However, we assume the expected proportion in population (p) to be 0.5 in order to have the highest sample size.

After inserting these figures into the previous equation, the total sample was 353. Distribution of sample between OPT hospitals depended on proportion of each hospital's cataract surgery patients from the total cataract surgery patients in OPT hospitals. Therefore, 32 patients were chosen from Hospital A, 148 patients from Hospital B, 24 patients from Hospital C, 12 patients from Hospital D, 59 patients from Hospital E, 24 patients from Hospital F, 34 patients from Hospital G, and 20 patients from Hospital H.

Visual acuity was obtained in 353 eyes after cataract surgery in 2019 to assess cataract surgery outcomes. WHO guideline for post-operative visual acuity was used, and the outcomes should match the recommended guideline as shown in table (2) to be considered satisfied.

**Table 2**

*WHO guideline for satisfied post operative visual acuity.*

<b>Post-operative visual acuity</b>	<b>With available correction</b>	<b>With best corrected visual acuity</b>
Good (6/6 – 6/18)	>80%	>90%
Borderline (< 6/18 – 6/60)	<15%	<5%
Poor (< 6/60 )	<5%	<5%

The satisfying outcomes according to the World Health Organization as in the table 2, the good outcomes have to be found in more than 80% in patients with uncorrected distance visual acuity, and more than 90% in patients with best corrected visual acuity. Moreover, the borderline visual acuity should be less than 15% in patients with uncorrected distance visual acuity and less than 5% in patients with best corrected distance visual acuity. Finally, the poor outcomes should be less than 5% in both patients with uncorrected and best corrected distance visual acuity.

Consents from selected cataract surgery centers were obtained (appendix 9).

### **3.3 Tools and Data Collection**

A data abstraction sheet (appendix 7) were given to the head of the surgical hospital to obtain information about human resources and available infrastructure needed for cataract surgery, Moreover, the price of surgery and medications used after surgery.

We then collected additional information from patients records using a data collection form the second questionnaire (appendix 8) which consists of four sections:

The first section covered demographic informations including patients place of origin, age, and sex.

The second section obtained the pre-operative patients information (cataract symptoms, cataract type, uncorrected and best corrected distance visual acuity, cataract maturity, pre-existing ocular and systemic comorbidity, and complicated surgery risks).

The third section consisted of intra-operative patients information (surgery date, surgery discharge, operated eye, surgery type, hospitalization, type of anesthesia, IOL type, IOL material, IOL name, and operative complications).

The four section covered the post-operative examination (uncorrected and best corrected distance visual acuity after cataract surgery and post operative complications).

### **3.4 Ethical Considerations**

The study followed the tenets of the Declaration of Helsinki. Ethical approval to conduct the study was obtained from the Institutional Review Board (IRB) committee at ANNU. Informed consent was obtained from all facilities participating in the studies. All facilities informed that their participation is purely voluntary. Study significance, objectives, benefits and harms were thoroughly explained in the consent form. All information and data collected were used for research purposes only, and were kept confidential and stored at the Department of Public Health at ANNU.

Back up files were created in an external hard disk in case of damage or loss of original data. Use of coded data were done to ensure maximum confidentiality. All consent forms were provided to participants in Arabic language to ensure they fully understand what their participation requires. All files reviewed, participant's names, hospital names and names on records were identified using codes.

### **3.5 Data Analysis**

The collected data were entered into the computer, cleaned, validated and coded using SPSS version 21. they were checked for any wrong entry, double entry and missing data

then it was corrected. Both CSR data and random patient records were analyzed, in addition to the general information about surgical services obtained from department heads.

Descriptive analysis were done to determine frequencies and means of the various variables and findings presented by means of graphs, tables and charts where appropriate. Confidence level were taken as 95% ( $p < 0.05$ ). We used appropriate statistical test to compare the mean differences between our variables that are explained in appendix 6.

## **Chapter Four**

### **Results**

#### **4.1 Cataract Surgery Rate**

As shown in table 3, in 2019, the highest number of cataract surgeries performed in OPT hospitals was 1803 cataract operation in Hospital B, followed by 724 cataract operations in Hospital E, and the lowest number was 90 center A. In 2020, the highest number of cataract surgeries performed in OPT hospitals was 1587 cataract operation in Hospital B, followed by 670 cataract operations in center C, and the lowest number was 92 in Hospital D and center G. Moreover, the highest number of cataract surgeries performed in OPT private centers was 690 operation in center C followed by 600 cataract operations in center E in 2019.

The exact number of cataract surgeries performed in OPT hospitals was 4301 in 2019 and 3181 in 2020. Moreover, the total number of cataract surgeries in OPT was 6620 in 2019 and 5432 in 2020.

**Table 3**

*Number of cataract surgeries in OPT hospitals and private centers.*

	<b>Number of cataract surgeries in 2019</b>	<b>Number of cataract surgeries in 2020</b>
Hospital A	396	419
Hospital B	1803	1587
Hospital C	288	104
Hospital D	146	92
Hospital E	724	152
Hospital F	287	283
Hospital G	418	236
Hospital H	239	308
Center A	90	110
Center B	130	125
Center C	690	670
Center D	345	350
Center E	600	640
Center F	464	264
Center G	0	92
<b>Total</b>	<b>6620</b>	<b>5432</b>

Number of OPT population in 2017: 2,881,957

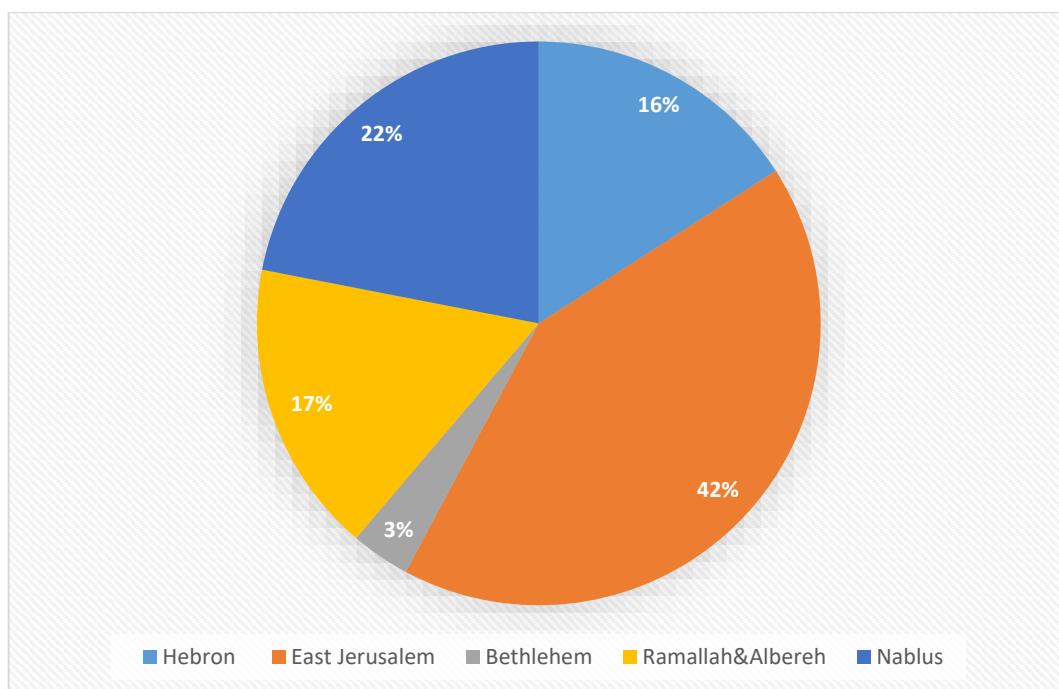
\* The number of population in this table was based on the Population statistic in the West Bank and East Jerusalem for the year 2017.

By using the CSR equation in figure 1, the CSR in the OPT was 2297 operations per million population per year (PMPY) in 2019 and 1885 operations per million per year in 2020.

In 2019, the number of cataract operations in the hospitals in Hebron directorate was 684 (16%), and in East Jerusalem the number was 1803 operations (42%), moreover, in Bethlehem, Ramallah, and Nablus directorate the number of cataract operations in the hospitals was 146 (3%), 724 (17%), and 944 (22%) operations respectively.

**Figure 2**

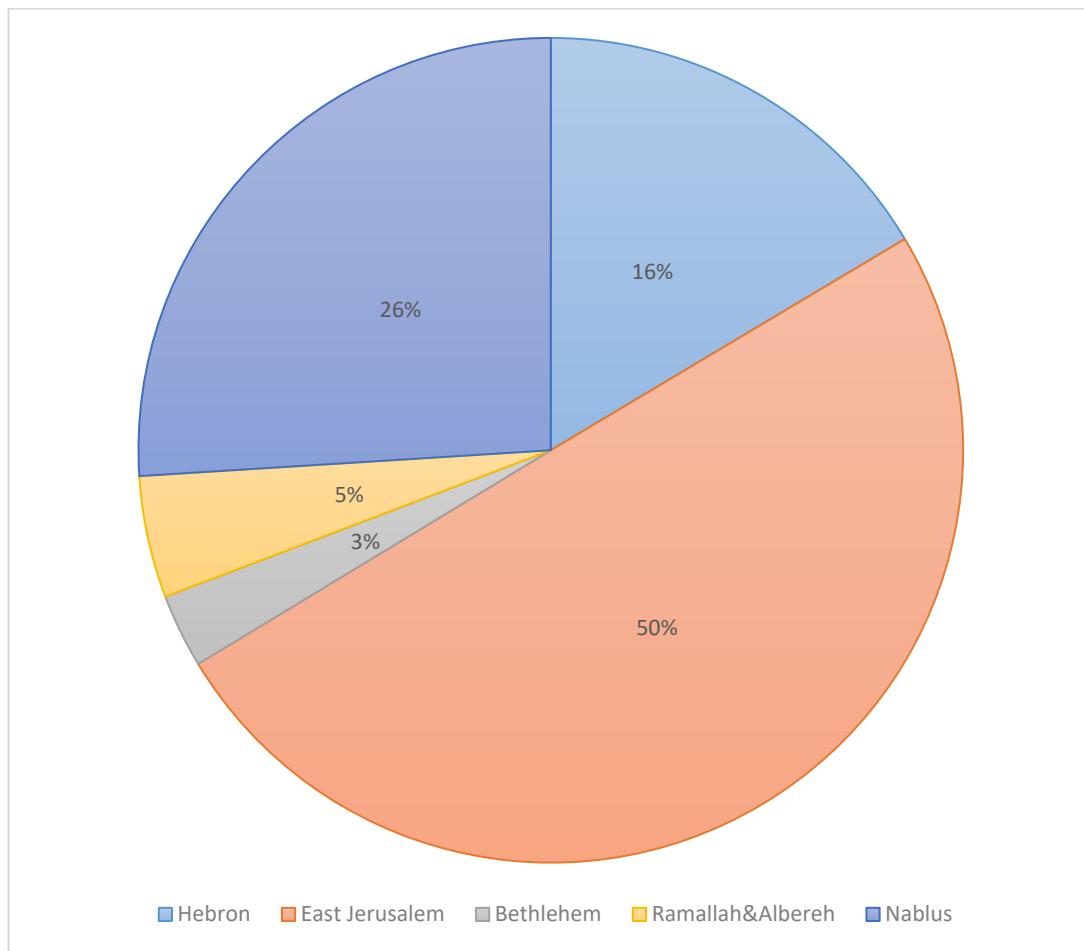
*Percent of cataract surgery in the hospitals in the directorates of OPT in 2019*



In 2020, the number of cataract operations in the hospitals in Hebron directorate was 523 (16%) cataract operations, East Jerusalem 1587 operations (50%), in addition to Bethlehem, Ramallah, and Nablus directorate the number of cataract operations was 92 (3%), 152 (5%), and 827 (26%) operations respectively.

**Figure 3**

*percent of cataract surgery in the hospitals in the directorates of OPT in 2020*



## 4.2 Eye health care facilities and services

### 4.2.1 Institutions information

A total of eight hospitals have been identified in the Occupied Palestinian Territories (West Bank and East Jerusalem), seven hospitals and one university hospital were included.

As shown in table 4, the study included three hospitals in Nablus, two in Hebron, and one each in Ramallah & Albereh (Turmosaya) directorate, Bethlehem (Beit Jala), and East Jerusalem (sheik jarrah). The majority of facilities locations (N=7) were urban, with one hospital located in rural areas.

**Table 4***OPT eye care institutions information*

<b>Variables</b>	<b>Number of hospitals (N=8)</b>
<b>Hospital location</b>	
Hebron	2
Turmosaya	1
Nablus	3
Beit Jala	1
Sheikh jarrah	1
<b>Directorate</b>	
Hebron	2
East Jerusalem	1
Nablus	3
Ramallah	1
Bethlehem	1
<b>Location</b>	
Urban	7
Rural	1
<b>Type of facility</b>	
University hospital	1
Non-university hospital	7

#### **4.2.2 Sectors of tertiary eye care centers**

Half of tertiary eye care centers (N=4) were identified as private, 3 as governmental, and one hospital as civil instructions.

#### **4.2.3 Human resources and services in eye care institutions**

Table 5 shows that the number of cataract surgeries per each cataract surgeon per week in OPT hospitals was (2 to 4) cataract surgery in four hospitals, (5 to 7) in two hospitals and (8 to 10) in two hospitals.

The maximum number of optometrists was three optometrists in 3 hospitals, followed by two optometrists in three hospitals, and the minimum was one in 1 hospital. The maximum number of nurses during cataract surgery was four in 1 hospital, followed by three nurses in two hospitals while the minimum number of nurses was two in 5 hospitals.

Most of tertiary eye care centers (N=5) perform fewer than 10 surgeries per week, one hospital perform from 11-20 surgeries per week, one hospital preform from 21-30

surgeries per week whereas one institution performing more than 30 surgeries per week which was the maximum number Of cataract surgeries.

The majority of hospitals (N=7) have one cataract operation room, while one hospital having two cataract operation rooms.

**Table 5**

*Qualified cadres and services in eye care hospitals of OPT.*

<b>Variables</b>	<b>Number of hospitals</b>
Number of cataract surgeries per cataract surgeon per week	
2-4 surgeries per surgeon per week	4
5-7 surgeries per surgeon per week	2
8-10 surgeries per surgeon per week	2
Number of optometrists in the facility	
1 optometrist	2
2 optometrists	3
3 optometrists	3
Number of nurses during cataract surgery	
2 nurses	5
3 nurses	2
4 nurses	1
Number of cataract surgeries per week	
1-10	5
11-20	1
21-30	1
More than 30	1
Number of cataract surgery rooms	
1 room	7
2 rooms	1

#### **4.2.4 Services for inpatients and anesthesia**

Out of the eight eye care hospitals, six have services for patients who need to stay in the hospital, and they all have beds available for inpatients.

Two hospitals use beds in any other available sector in the hospital, one hospital have more than 20 beds, the remaining hospital (N=1) have three or less beds.

The vast majority of hospitals (N=5) have no inpatients per week, while one hospital have fewer than 10 patients per week.

Most hospitals (N=7) used topical anesthesia as their primary anesthesia option, while one hospital used general anesthesia as their primary anesthesia option.

**Table 6**

*Availability of services and anesthesia type in eye care hospitals in OPT.*

<b>Variables</b>	<b>Number of hospitals</b>
Services availability for patients if they need to stay hospital	
Yes	6
No	2
beds for inpatients availability (n=6)	
Yes	6
No	0
Number of beds (n=6)	
1	1
3	1
More than 20	2
Other sectors	2
Number of inpatients per week (n=6)	
Zero	5
Less than 10	1
Anesthesia (n=8)	
Topical	7
General	1

#### **4.2.5 Cataract surgery decision and instructions**

When deciding whether to perform cataract surgery, the ophthalmologists at the eight institutions base their decision 100% on the impact of the cataract on the patients' vision, whereas no institution performs the procedure because the patient has been diagnosed with cataract without affecting their vision.

After cataract surgery, all institutions provide patients written instructions and a medication schedule, as well as a follow-up program. Out of the eight hospitals, seven use phacoemulsification as the primary procedure for cataract removal; however one hospital use Extracapsular cataract extraction (ECCE).

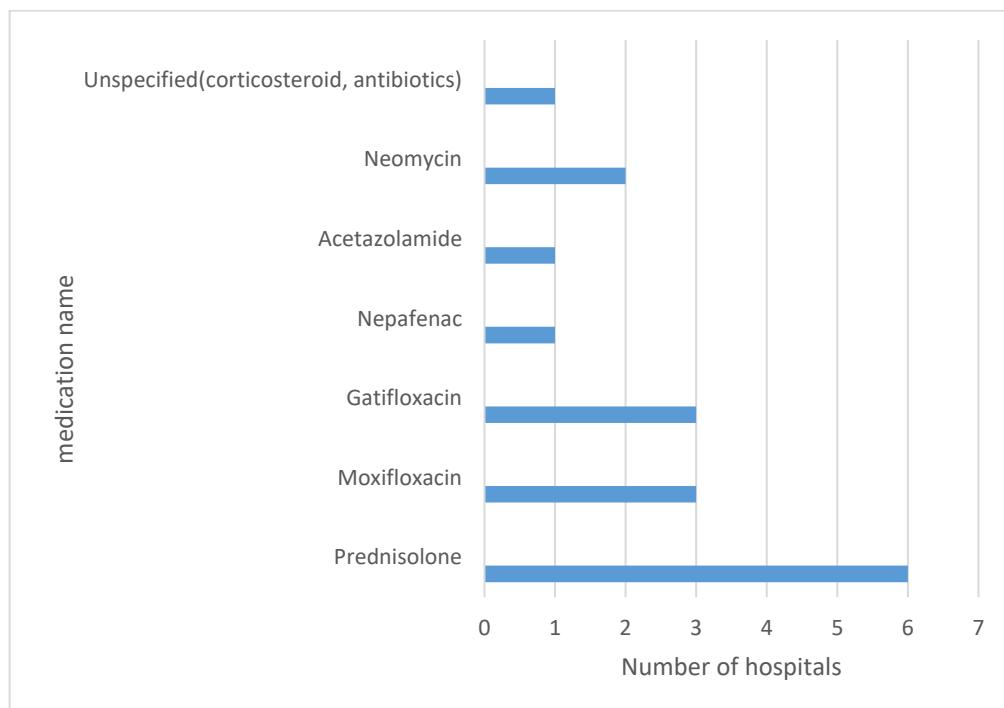
**Table 7***Cataract surgery decision and instructions in eye care centers in OPT.*

<b>Variable</b>	<b>Frequency</b>
Decision for surgery depends on:	
The effect of cataract on patient vision	8
Since patient diagnosed with cataract	0
Others	0
written instructions and a medication schedule for patients	
Yes	8
No	0
Follow-up program after operation	
Yes	8
No	0
Most common type of cataract surgery	
phacoemulsification	7
ECCE	1

As shown in Figure 4, of eight, most of hospitals (N=6) prescribed Prednisolone after cataract surgery, while only one hospital prescribed corticosteroids and antibiotics without specifying their names. However, Maxifloxacin and Gatifloxacin prescribed by three hospitals. Moreover, Acetazolamide prescribed by one hospital. Neomycin prescribed by two hospitals and Nepafenac prescribed by one hospital.

**Figure 4**

*Name of drugs prescribed by hospitals after cataract surgery in OPT.*



#### **4.2.6 Financial aspects of cataract surgery**

As referred to table 8, the financial aspects of cataract surgery, the cost of cataract surgery in OPT ranges from 125 US \$ with insurance in governmental facilities (N=3) to 930\$ or more in private institutions (N=1).

All the OPT hospitals accept insurance, with 7 hospitals accepting governmental and military insurance, 5 hospitals accepting private insurance, and 2 hospitals accepting costs covered by UNRWA.

Out of eight, (N=5) of hospitals offering discount on the cost to those in need who do not have insurance.

**Table 8**

*Financial aspects of cataract surgery in eye care hospitals in OPT.*

<b>Variable</b>	<b>Number of hospitals</b>
Cataract surgery cost( US \$)	
insurance + 125	3
600 - 750	2
760 - 900	2
930 or more	1
Does the hospital accept insurance?	
YES	8
NO	0
Insurance types(multiple answer)	
governmental	7
military	7
Private	5
Others	2
Does the hospital offering discount to the patient if he does not have insurance?	
Yes	5
No	3

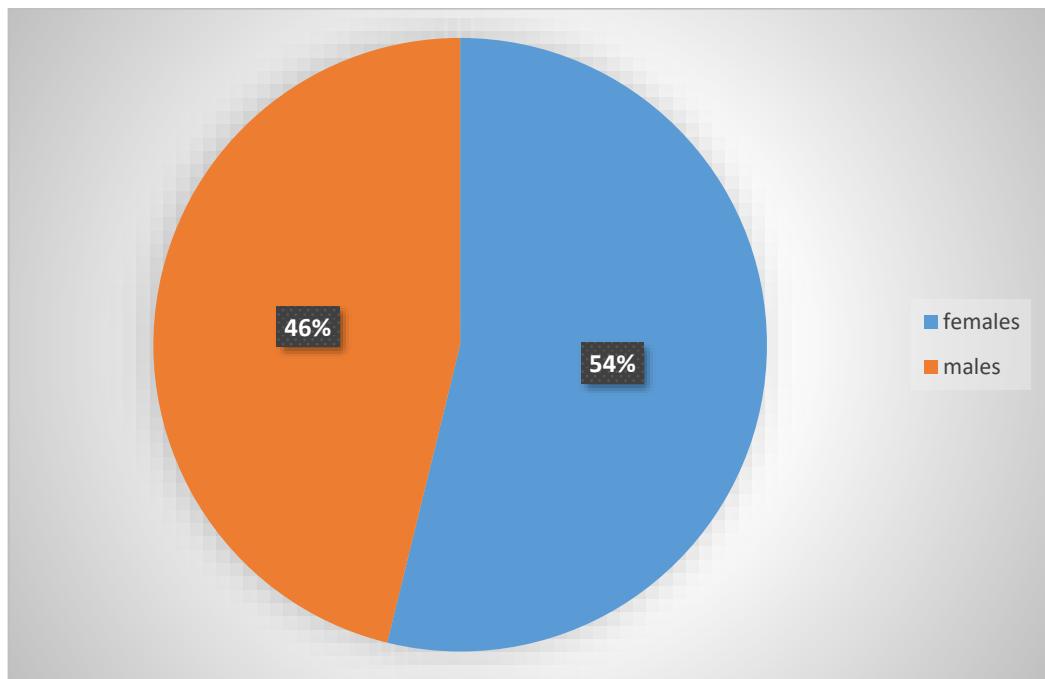
### **4.3 Patients characteristics**

#### **4.3.1 Sociodemographic characteristics**

Out of 353 patients, 53.8% were females and 46.2% were males. Most of patients (52.1%) were above 65 years old, 20.7% (n=73) of the participants their age from 60 to 65 years, 21% (n=74) their age from 50 to 59 years, and 4.5% (n=16) their age from 40 to 49 years, and only 1.7% (n=6) their age below 40 years old.

**Figure 5**

*prevalence of cataract surgery differences in males and females.*



Amongst 262 patients, 41.2% from Nablus directorate, 24.4% from Hebron, and 15.6% from East Jerusalem, patients from the other directorates as referred to appendix 1.

#### **4.3.2 Health characteristics of patients**

##### **4.3.2.1 Pre-operative Patients information**

As shown in table 9, the highest percent of cataract symptoms was blur vision 81.6 % (n=111), followed by gradual decreased vision 15.4% (n=21), patients coming to hospital without complaining of cataract symptoms 2.2% (n=3), finally glare was recorded in 0.7% (n=1) of patients.

Prior to cataract surgery, the proportion of uncorrected binocular visual acuity in patients with normal vision (6/6 to 6/12) was 38.8% (n=88), while mild (>6/12 to 6/18), moderate (> 6/18 to 6/60) , and severe vision impairment (VI) (> 6/60 to 3/60) were 30% (n=68), 22% (n=50), 7% (n=16), respectively. However, only 5 patients (2.2%) were blind (> 3/60).

For patients with best-corrected pre-operative binocular visual acuity, the majority of patients had normal vision 58.1% (n=104), while 21.8% (n=39) had mild VI, 10.1%

(n=18) had moderate VI, and 3.3% (n=6), 0.5% (n=1), of patients had sever VI and blindness, respectively.

Nuclear sclerosis (NS) was the most common cataract type (38.7%, n=75), followed by posterior sub-capsular cataract (19.1%, n=37), cortical cataract (4.1%, n=8), unspecified cataract (2.1%, n=4), patients with more than one type of cataract were classified as mixed or combined form, which represent the second most common type of cataract (33.5%, n=65). Other types of cataract include brunescence cataract (1%, n=2), and morgagnian cataract (1.5%, n=3).

**Table 9**

*Pre-operative Patients information.*

Variables	Options	Frequency	Valid percent	Missing
Cataract symptoms	Glare	1	0.7	
	Blur	111	81.6	
	No symptoms listed	3	2.2	217
	Other, specify (decreased vision gradual)	21	15.4	
	Normal (6/6 to 6/12)	88	38.8	
Uncorrected Pre-operative Distance binocular Visual Acuity	Mild VI (>6/12 to 6/18)	68	30	
	Moderate VI (> 6/18 to 6/60)	50	22	126
	Severe VI (> 6/60 to 3/60)	16	7	
	Blindness (> 3/60)	5	2.2	
	Normal (6/6 to 6/12)	104	58.1	
Best corrected Pre-operative Distance binocular Visual Acuity	Mild VI (>6/12 to 6/18)	39	21.8	
	Moderate VI (> 6/18 to 6/60)	18	10.1	174
	Severe VI (> 6/60 to 3/60)	6	3.3	
	Blindness (> 3/60)	1	0.56	
	Not applicable (N.A)	11	6.14	
Morphological Cataract Classification	Nuclear sclerosis	75	38.7	
	Cortical cataract	8	4.1	
	Posterior sub-capsular cataract	37	19.1	159
	Unspecified	4	2.1	
	Combined form	65	33.5	
	Others	5	2.5	

#### **4.3.2.2 Systemic and ocular comorbidities of patients**

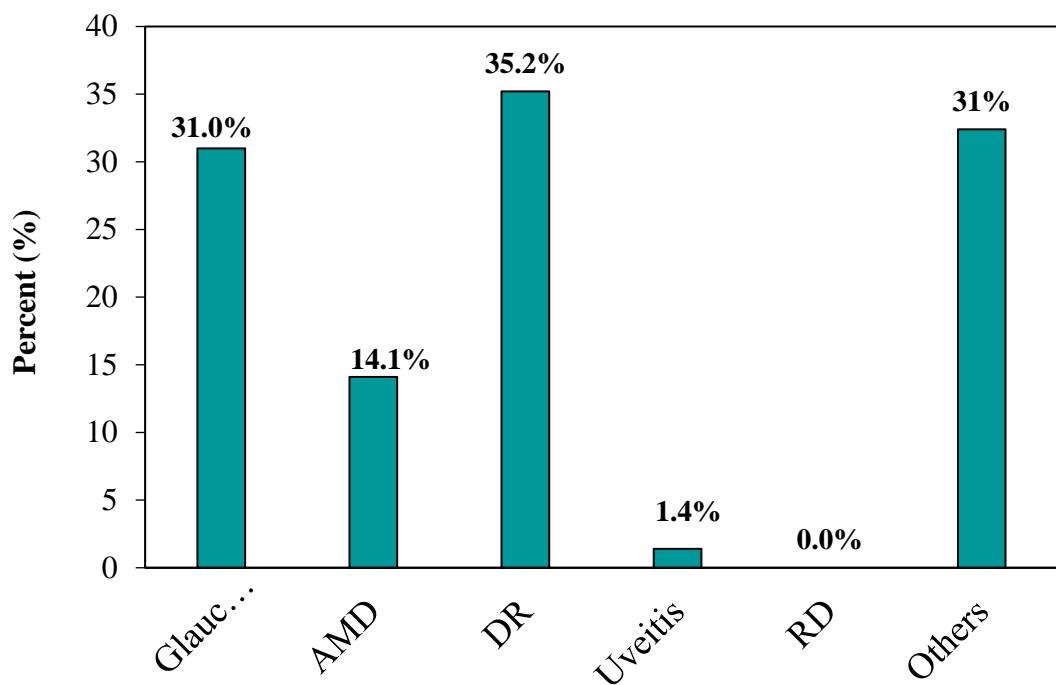
There was a history of ocular comorbidity in 20.1% (n=71) of patients, 87.3% (n=62) of them had one ocular comorbidity, and 12.7% (n=9) had two ocular comorbidities.

Most of patients (n=25, 35.2%) had diabetic retinopathy (DR), followed by glaucoma (n=22, 31.0%), age related macular degeneration (AMD) (n=10, 14.1%), and Uveitis (n=1, 1.4%).

Other ocular comorbidities (31%, n=22) included diabetic macular edema DME (n= 3), phacodonesis (n=3), Salzmann degeneration (n=2), floppy iris syndrome (n=2), and others, as shown in figure 6.

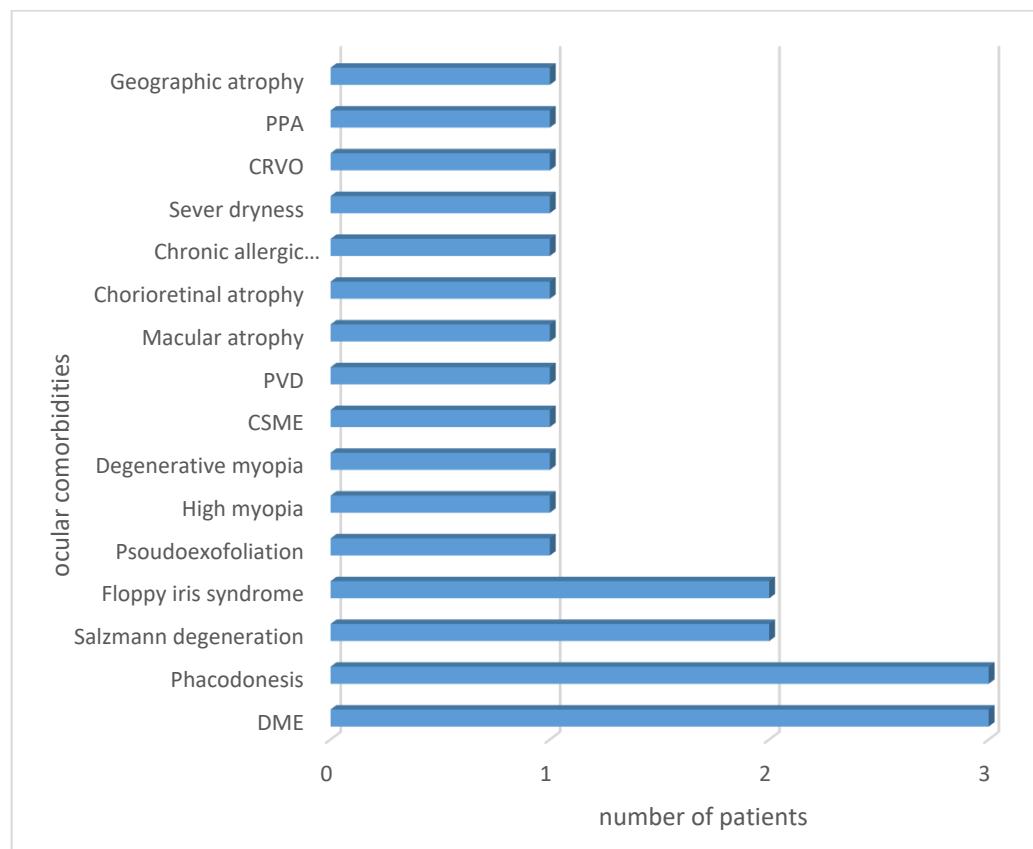
**Figure 6**

*ocular comorbidities in cataract patients in OPT.*



**Figure 7**

*Other ocular comorbidities in cataract patients in OPT.*



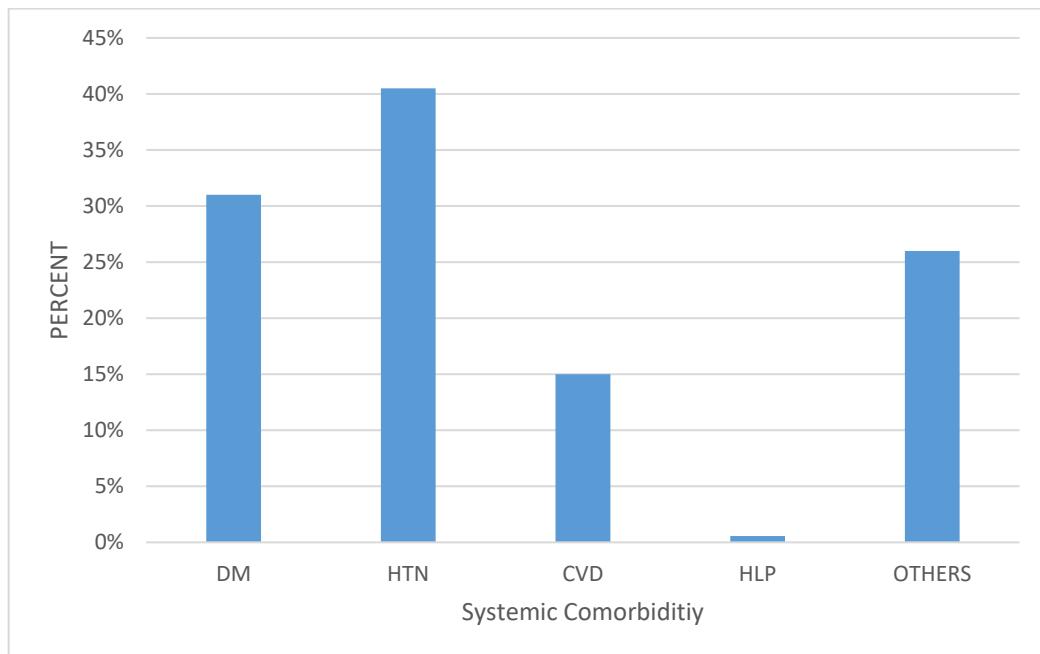
#### **4.3.2.3 Systemic comorbidities**

Of all patients, 60.6% (n=214) had a history of systemic comorbidity, and 14.2% (n=50) had no systemic comorbidity, while 25.2% (n=89) were missing. (38.8%, n=83) of patients with systemic diseases had one systemic comorbidity, 39.7% (n=85) had two systemic comorbidities, 17.8% (n=38) had three systemic comorbidities, whereas 3.7% (n=8) had more than three.

Of 353 patients, 30.9% (n=109) had DM, 40.5% (n=143) had HTN, 15% (n=53) had cardiovascular disease (CVD), hyperlipidemia (HLP) 0.57% (n=2) and 26% (n=92) had other systemic comorbidities such as: asthma (n=13), renal diseases (n=9), hypothyroidism (n=7), chronic obstructive pulmonary disease (COPD) (n=5), and others. 60.6% (n=214) of cataract patients have systemic comorbidities, and 20.1% (n=71) have ocular comorbidities, whereas 17.3% (n=61) have both systemic and ocular comorbidities.

**Figure 8**

*Systemic comorbidities of cataract patients in OPT.*



#### **4.3.2.4 Patients intraoperative cataract surgery information**

Of 353 patients, 9.9% (n=35) received cataract surgery for the first eye, and 9.9% (n=35) received cataract surgery for the second eye. The majority of cataract surgery cases were phacoemulsification 86.4% (n=305), however 13.6% (n=48) were Extracapsular cataract extraction (ECCE).

Amongst 353 patients, only 0.5% (n=2) of patients were stayed in the hospital after cataract surgery, while 99.1% (n=350) leaved hospital on the same operation day. Most of patients had cataract surgery under topical anesthesia 75.9% (n=268), and 10.4% (n=37), 7.3% (n=26) received surgery under sub-Tenon and general anesthesia, respectively.

One hospital recorded the name of the intraocular lens used after cataract removal. Of 353 patients, Trufold intraocular lenses were used by 5% (n=18), and Excelnce IOLs were used by 1.7% (n=6), all of which were standard IOLs, with one hospital recording one premium (multifocal) IOL.

Out of 353 patients, 33.7% (n= 119) undergone cataract surgery without operative complications, while 0.8% (n=3) had complicated cataract surgery with unspecified (unrecorded) reason, and one patient had vitreous opacity.

#### **4.3.2.5 Patients post-operative cataract surgery information**

After cataract surgery, 68.6% (n=177) of patients had uncorrected binocular visual acuity that was normal, whereas mild, moderate, and severe vision impairment were 21.71% (n=56), 7.75% (n=20), and 1.94% (n=5) correspondingly, however no blindness cases.

For patients with best corrected binocular visual acuity post cataract surgery, 85.55% (n=148) of patients were normal, 6.94% (n=12) were mild vision impairment, and 4.04% (n=7) were moderate vision impairment, whereas no blindness, not applicable cases were 3.47% (n=6).

#### **4.3.2.6 Cataract surgery complications**

It was not recorded whether or not complications occurred post cataract surgery.

#### **4.3.3 Cataract surgery outcomes**

Of 254 cataract-operated eyes without corrected distance visual acuity, 81.89% achieved good visual acuity ( $\geq 6/18$ ), 11.42% had borderline acuity ( $< 6/18-6/60$ ), and 6.69% had poor visual acuity ( $< 6/60$ ).

Out of 211 cataract-operated eyes with best-corrected visual acuity, 93.84% had good visual acuity ( $\geq 6/18$ ), 5.21% had borderline acuity ( $< 6/18-6/60$ ), and 0.95% had poor visual acuity ( $< 6/60$ ).

**Table 10***Uncorrected and Best-corrected visual acuity post cataract surgery of patients in OPT*

<b>Eyes with Uncorrected post-operative distance visual acuity</b>		
Visual acuity	Frequency	Percentage
Good	208	81.89
Borderline	29	11.42
Poor	17	6.69
Total	254	100.0

<b>Eyes with Best-corrected post-operative distance visual acuity</b>		
Variable	Frequency	Percentage
Good	198	93.84
Borderline	11	5.21
Poor	2	0.95
Total	211	100.0

In the four complicated surgery patients, (n=2) of them had good outcomes, while the other two patients had Borderline (n=1), and poor outcome (n=1). As complications of cataract surgery during the surgery represents 3.2%.

## **Chapter Five**

### **Discussion**

#### **5.1 Cataract surgery rate in OPT**

As cataract is the leading cause of preventable blindness worldwide, quantity and quality of cataract surgery play a significant role in reducing cataract blindness (1), CSR is a quantifiable measure that indicates that cataract blindness in countries is being eliminated, and used to measure cataract services delivery and accessibility to cataract patients worldwide (6). The CSR in OPT decreased from 2297 operations per million per year (PMPY) in 2019 to 1885 in 2020 due to corona virus pandemics.

Despite the fact that there are facilities for patients to pass through the closure points during quarantine, many people chose not to receive this elective surgery, possibly to reduce their virus exposure. Moreover, the number of cataract operations in hospitals was affected more than in private centers by the Corona virus period in 2020, possibly, because people avoided hospitals during the Corona period as hospitals are more crowded than private centers and there were corona patients in the hospitals.

As predicted, the CSR in both years was lower than the minimum CSR recommended by WHO. This is a minimum estimate, due to the lack of data on Palestinians having cataract surgery in other countries or from Israeli centers concerning the number of Palestinian in East Jerusalem having cataract surgery in their facilities. Moreover, the elderly in the Palestinian population constitute a small proportion of our young society. In 2020, the percentage of individuals aged (0-14) years constituted 36% of the total population of West Bank, individuals aged (30-59) years constituted 29%, and the elderly population aged (60 years and above) constituted 6% of the total population (57). As a result, CSR in the OPT will be much higher in the age group of 50 years and older.

According to a study conducted in OPT in 2015, the CSR was 2117 operations PMPY (31), which included all hospitals and centers providing cataract surgery services in OPT, and it was still less than the 3000PMPY recommended by WHO.

## **5.2 CSR Globally**

According to the latest data available for CSR globally, developed countries had the highest CSRs compared to developing countries, which had lower CSR than high-income countries. High-income nations such as Malta and Japan were reported the highest CSR nationally to be 11085 in 2015 and 10198 in 2013, respectively, while the lowest CSRs were recorded in Sub-Saharan Africa regions such as Liberia and Uganda, 157 in 2014, 192 in 2010, respectively, according to the International Agency for the Prevention of Blindness (IAPB) atlas vision.

In North Africa and the Middle East, Kuwait had a CSR of 1462 in 2014 which was nearly similar to our results, and countries bordering the OPT, such as Jordan, had 1126 operations in 2006 (8, 24), despite their CSRs being lower than the WHO-recommended CSR. Egypt, on the other hand, reported 3674 operations PMPY, which was slightly higher than the WHO-recommended CSR (15).

## **5.3 Surgical procedures and services used for cataract removal Surgery technique**

Most of cataract surgeries 86.4% in OPT performed by phacoemulsification while 13.6% performed by ECCE, since our ophthalmologists are qualified to perform phacoemulsification, seven of eight hospitals in OPT depend on phacoemulsification as a primary procedure of cataract removal.

In the Middle East, Egypt had nearly the same as our results, accounting for 85.6% of cataract surgeries done by phacoemulsification in the private sector in 2015, however, 41% in the governmental sector, due to the high cost of equipment and consumables related to phacoemulsification (15).

The rate of phacoemulsification in Yemen was 17.9% in 2012 (14), which is much lower than our results, whereas the rate in Iran was at least 97% of cataract surgeries performed by phacoemulsification (18), which is higher than our results since there is a hospital in OPT that uses ECCE as a primary procedure because it only has one doctor who performs cataract operations and he is only qualified to perform ECCE and not phacoemulsification.

## **Type of anesthesia**

The majority of our hospitals (N=7) depends mainly on topical anesthesia for performing cataract surgery, while one hospital performs cataract surgery mainly under general anesthesia to avoid head drift and excessive eye movements, which increases the risk of intraoperative ocular injury (58). Of 331 patients, 80% had cataract surgery under local anesthesia. Our findings are consistent with those in the USA, Canada, Malaysia, Korea and Singapore, where topical anesthesia is the anesthesia of choice for cataract surgery (32). Moreover, in a survey of cataract surgery practices patterns worldwide it was found that topical anesthesia among participants is the preferred choice of anesthesia in more than 90% of routine cases (33).

Since topical anesthesia is free of sight-threatening complications, provides better pain control, safe procedure and provides shorter operative time than other anesthesia techniques, the preferring of topical anesthesia is growing worldwide (32, 34).

## **Hospitalization**

In OPT, six of our 8 institutions provided services for inpatients. Moreover, there were beds enough for patients who needed to stay hospital after surgery, or they transferring cataract patients to any available bed in any department of the hospital; however, inpatients were very rare in most of our hospitals. With the except of one hospital in East Jerusalem, where five to ten patients weekly stay in the hospital due to long distance and accessibility difficulties, and elderly patients with disabilities who cannot return to hospital after few days of surgery.

Cataract surgery had transitioned from inpatient to outpatient surgery worldwide, and this transition has had no adverse effect on the outcomes of cataract surgery (30).

Cataract surgery in Palestine followed the international standards, with OPT cataract surgery being outpatient procedure and the need for hospitalization in few cases mostly due to accessibility issues and the elderly with disabilities, both of which are unrelated to adverse outcome issues.

## **5.4 Vision impairment and blindness in OPT**

Prior to cataract surgery, visual acuity was normal (6/6 – 6/12) in 38.8% of patients' better eye without correction, and 58.1% of patients with best-corrected visual acuity; however, after cataract surgery, patients with normal vision increased to 68.6% in patient without any correction, and to 85.5% in patients with best-corrected visual acuity.

Mild vision impairment (<6/12 – 6/18), moderate (<6/18 – 6/60), and severe vision impairment (<6/60 – 3/60) were found in 30%, 22%, and 7% of patients without correction, respectively. They were improved to 21.8%, 10%, and 3.3% in patients with best-corrected visual acuity, respectively, whereas after cataract surgery, the results improved to 21.7% mild VI, 7.7% moderate VI, and 1.9% severe VI in patients without correction. Moreover, 6.9% mild VI, 4% moderate VI, and zero severe VI in patients with best-corrected visual acuity.

Finally, blindness (< 3/60) before surgery was 2.2% in patients without correction and 0.5% in patients with best correction, while after surgery; blindness in both patients with and without correction was zero percent. As a result, cataract and uncorrected refractive errors are the most common causes of vision impairment and blindness in OPT as in worldwide (2).

## **5.5 Cataract surgery outcomes**

WHO guideline regarding post-operative visual acuity were used to evaluate cataract surgery outcomes in OPT. Outcomes of cataract surgery are one of the most important factors affecting CSR worldwide (59).

The need for measuring visual outcomes is a critical element in measuring and evaluating our achievements towards the goal of eliminating avoidable blindness due to cataract because reliance only on the numbers of cataract surgeries performed would result in a state of undesired complacency (60).

The good outcomes (6/6 – 6/18) was found in 81.9% of eyes without correction and 93.8% of eyes with best-corrected visual acuity, and both results were matched with >80% and >90% WHO guideline for visual acuity after cataract surgery, respectively. Boorderline outcomes (< 6/18 – 6/60) were found in 11.4% of eyes without correction which was matched with the <15% WHO goudline and 5.2% of eyes with the best spectacle

correction which was very near to the < 5% recommended by WHO. Finally, poor outcomes (< 6/60) were found in 6.7% of eyes without correction which was slightly higher than the <5% WHO recommendations for poor outcomes, however, with best-corrected visual acuity, the percent of poor outcomes decreased to 0.95% which was matched with the recommended <5% WHO guideline.

Finally, the outcomes of cataract surgery in OPT hospitals were satisfied and matched with WHO guideline and this indicates that our level of care in OPT were similar to the international standards and the low CSR in the OPT was not related to the outcomes of surgery.

In the past, a study was conducted in the OPT between March 1993 and March 1994 to evaluate cataract surgery outcomes, and good outcomes were obtained in 54.5% of eyes, 23.2% borderline outcomes, and 22.3% of eyes had a poor outcome (35). As seen, outcomes of cataract surgery in 1993 and 1994 in OPT were not satisfied and were far from the WHO guideline for satisfactory outcomes; however, according to our findings, OPT services and outcomes had improved and met international standards.

## **5.6 Systemic comorbidities in cataract patients**

The most common systemic comorbidity associated with cataract was hypertension, which was found in 40.5% of 214 cataract patients, and the second most common disease was diabetes, which was found in 30.9% of cataract patients. Several studies have confirmed the association between diabetes mellitus and cataract formation (36, 37, and 38). Moreover, hypertension or elevated blood pressure raises the risk of cataract (39).

Another study conducted in OPT between 1993 and 1994 revealed that the most common systemic comorbidities associated with cataract were diabetes mellitus and hypertension (40). In our study, nearly 61% of cataract patients in Palestine had a history of systemic comorbidities, moreover, 38.8% of patients with systemic diseases had one disease, 39.7% had two diseases, 17.8% had three diseases, whereas 3.7% (n=8) had more than three.

A study conducted in western Sydney founded that 92.5% of cataract patients had one or more preoperative comorbidities.

The same as our study, the most common systemic comorbidities was hypertension in 56.3% of cataract patients followed by diabetes in 169 (27.5%) cataract patients (43). Most of the studies worldwide revealed that diabetes and hypertension are frequent in cataract patients, as in this study.

### **Pre-existing ocular comorbidities**

There was a history of ocular comorbidity in 20.1% (n=71) of patients, 87.3% (n=62) of them had 1 ocular comorbidity, and 12.7% (n=9) had two ocular comorbidities. In the study conducted in western Sydney, the pre-existing ocular comorbidities that might affect the visual outcomes after cataract surgery founded in 63% of cataract patients (43). Most of patients in our study (n=25, 35.2%) had diabetic retinopathy (DR), and (n=10, 14.1%) had age related macular degeneration (AMD).

In the study of Sydney, the Majority of ocular comorbidities founded preoperatively included age related macular degeneration in 82 eyes (12.6%) and 9% had diabetic retinopathy (43). DR is much higher in our study than in the Sydney study because the prevalence of diabetes in OPT was 33.2% and prevalence of DR in diabetic patients was 48% in 2018 (61), while prevalence of diabetes in Australia was 7.9% in 2018 (62) which was significantly lower than the prevalence of diabetes in OPT. Diabetes and diabetic retinopathy are significant public health problems in Palestine (61).

A descriptive cross-sectional study conducted in Iran in 2018, the most common eye diseases detected in patients undergoing cataract surgery were pseudo exfoliation syndrome (8.2%), followed by diabetic retinopathy (6.8%), in addition to glaucoma (4.2%) (42). Another study conducted in the UK, observed that the most common eye diseases in the UK are age-related macular degeneration (9.8%), and followed by glaucoma (9.2%), in addition to diabetic retinopathy (4.1%) (42).

In all the studies of patients with cataract which undergoing cataract operation, diabetic retinopathy and glaucoma are common.

## **Cataract type**

The most common type of cataract in Palestine was Nuclear sclerosis (NS) (38.7%, n=75), followed by posterior sub-capsular cataract (19.1%, n=37), and cortical cataract (4.1%, n=8), however, unspecified cataract was (2.1%, n=4). Patients with more than one type of cataract were classified as mixed or combined form, which represent the second most common type of cataract (33.5%, n=65).

Other types of cataract which represent the least common types in Palestine, include brunescence cataract (1%, n=2), and morgagnian cataract (1.5%, n=3).

In Russia from 2015 to 2017, the prevalence of nuclear cataract was 38%, followed by cortical cataract 14.5%, and 0.6% for posterior sub-capsular cataract; however, the prevalence of any other type of cataract was 44.6% (44). In China, cortical, nuclear, and posterior sub-capsular cataract prevalence was 28.6%, 24.3%, and 4.4%, respectively and combined form of cataract, nuclear and cortical cataract was the most common type of cataract (40.0%) (51).

The study in Russia revealed that nuclear cataract was the highest prevalence comparing to any other types of cataract, as in our study, nuclear sclerosis was the highest prevalence in Palestine. A comprehensive systematic review study conducted in 2016, about the prevalence of cataract types revealed the differences between countries in the prevalence of cataract types (45), thus, there are differences in the prevalence of cataract types between our study and the study of China. Furthermore, the differences between countries in the prevalence of cataract and cataract types could be attributed to differences in the characteristics of each study population as well as the methods and criteria used to assess the presence of cataract (63).

Age and diabetes are the two main risk factors for cataract formation in Palestine since they are considered to be risk factors for all types of cataract (63).

## **Gender differences for receiving cataract surgery**

Women undergoing cataract surgery in Palestine was 53.8%, while men 46.2%. However, in a study conducted in Palestine revealed that the prevalence of cataract among women (4.3%, 95% CI: 3.3–5.2%) higher than in men because women were marginally more

likely than men to mention poverty as a reason for not having cataract surgery. However, the study found gender disparities, with women having a higher prevalence of blindness and having lower cataract surgery coverage than men (35), and this pattern was seen in the developing countries.

In developing countries, from a literature review and meta-analysis of cataract surveys, they revealed that the cataract surgical coverage rate was 1.2-1.7 times greater for men than for women. For women, despite of their lower cataract surgical coverage rate, women accounted for nearly 63% of all cataract patients in the populations of the study. Moreover, the prevalence of reversible blindness due to cataract would be decreased by a median of 12.5% (range 4-21%) if women received cataract surgery at the same rates as men (46).

In Latin America, women getting cataract surgery had a non-statistically significant OR of 1.01 (95% confidence intervals [CI]: 0.86–1.18) as compared to men with a visual acuity (VA) of 3/60 on an eye basis. As a result, in Latin America, gender does not appear to be a significant factor of undergoing cataract surgery (47). Comparatively, in developed nations, Epidemiologic research indicates that cataract is more common in women than in men. This is not just related to a higher rate of cataract surgeries received in women in the Western world; many population-based studies reveal that women have a higher prevalence of cataract and lens opacification (48).

As a result, in developed nations, cataract surgical coverage was higher in women, and in developing countries, the coverage was higher in men. In Palestine, women in the past had a lower opportunity of receiving cataract surgery than men, however, the opportunity of receiving cataract surgery in women in 2019 increased to be slightly higher than men received surgery.

### **Complications during cataract surgery**

In our study, 119 of 123 patients received cataract surgery without intra-operative complications, while three patients had complicated cataract surgery with unrecorded reasons, and one patient had vitreous opacity, means that the prevalence of complications during cataract surgery was 3.2%. In Iran, the prevalence of complications during cataract surgery was 4.15%. Patients experienced many intraoperative complications, 2.86, 0.69,

0.06, 0.39, 0.03, and 0.11 % of patients had experienced posterior capsular rupture and vitreous loss, posterior capsular rupture without vitreous loss, retro-bulbar bleeding, supra-choroidal hemorrhage, IOL drop, and nucleus drop, respectively (49).

In Mexico, the prevalence of Complications were recorded in 106 cases (0.05%). Posterior capsular rupture was the most common complication in 52% (n=55) of the cases, followed by zonular dialysis (18%), and capsulorhexis tear (13.2%). Moreover, Descemet membrane separation (5.7%), expulsive choroidal hemorrhage (1.9%), and acute endophthalmitis (1.9%) were the least common (50).

The prevalence of complications during cataract surgery in Palestine was lower than in Iran and higher than in Mexico, however, more studies with a larger samples needed in Palestine to assess the prevalence of intra-operative cataract complications.

### **5.7 Study Strengths and limitations**

Cataract surgery rates in 2019 and in 2020 during the corona virus pandemic did not assessed in the Occupied Palestinian Territories before, and it is unknown whether cataract surgical outcomes and services adequate or sufficient in meeting the needs of the Palestinian population.

Poor cataract surgery outcomes deter patients from undergoing cataract surgery. The aim of this study is to measure the cataract surgery rate in the OPT. Moreover, cataract surgery outcomes have previously measured in the country before, but the results were unsatisfactory and fell short of the international standards. Our study evaluated the cataract surgery outcomes to see whether outcomes were improved or remained unsatisfactory.

During this study, a few difficulties were encountered, such as high missing rate and incomplete records as well as bias in the information filled out by the surgeons of the hospitals. Furthermore, due to a lack of information about visual acuity in all patients during the same time period, the visual acuity of patients after cataract surgery was assessed at different times.

We needed more time and effort to get data, especially in hospitals with many departments and all data in the same room, because the information needed from the

patients was dependent on the records, and those records in many hospitals were not electronic records.

The importance of conducting the study and the benefits of sharing patient records were clarified for each hospital and purposive selection for participation hospitals was carried out to avoid sample selection bias.

### **5.8 Conclusion and Recommendations**

Cataract surgery rate and cataract surgery visual outcomes have improved understanding of the effectiveness of cataract surgery in the nation. It is a quantifiable indicator used to evaluate patient accessibility to cataract surgical services and contribute to the elimination of cataract blindness. Our results revealed that the cataract surgery rate in the Occupied Palestine was lower than the WHO-recommended CSR; however, considering the young population of the country as cataract mostly affect elderly patients, and surgeries in private centers did not included in the study. Moreover, the number of cataract surgeries in Gaza that was not assessed, and the patients undergone cataract surgery in Israeli hospitals in East Jerusalem, with all these numbers, the CSR will be higher than our results. The observed rate underestimates the cataract surgery rate in the country for all the reasons above.

As outcomes of cataract surgery in OPT in the past were away from WHO satisfactory outcomes, our results revealed an obvious enhancement as the cataract surgical outcomes as it was very close to the satisfactory outcomes recommended by WHO. Even the outcomes of cataract surgery were enhanced, the cataract surgery rate remains below the recommended WHO rate, and thus, there is a need to increase CSR across the nation.

More focus should be placed on making sure that good visual outcomes are actually being realized through postoperative visual acuity monitoring and prompt refraction for all patients.

In addition to cataract surgery rates, outcomes and services, cataract surgical coverage (CSC) or how many patients received cataract surgery from the cataract patients. Cataract surgical coverage is very important and never assessed recently in the Occupied Palestine before.

For eye care providers, CSC studies should be conducted to assess services of cataract surgery and quality of eye care in the country to reveal the reasons behind low CSR. Moreover, prevalence studies of cataract, and follow up studies should be conducted to assess cataract surgery rates, services and outcomes.

A cross sectional study should be conducted to assess cataract surgery rate among people aged <50 years in Occupied Palestine.

Further studies are needed to determine and evaluate the magnitude and causes of poor visual outcomes from cataract surgery in Occupied Palestine, since surgical procedures, and systemic comorbidities such as diabetes may all have an effect. In addition, an assessment and evaluation of services from the patients' perspective would be a good addition to the research.

For Optometrists in optometry centers, they should encourage patients who require cataract surgery and refer them to ophthalmologists because they are more familiar with patients. Furthermore, due to missing data, optometrists working in hospitals should record visual acuity before and after surgery in the hospital's computer system, not just on the card given to the patient.

For Ophthalmologists, they should enter information about the patient's cataract type and symptoms, as well as ocular and systemic comorbidities, into the hospital computer system due to very high missing rate for these data.

For tertiary eye care centers, they should ensure that patients return for follow-up visits and measure visual acuity to ensure that the visual outcomes are satisfactory in the institution. Furthermore, encouraging patients to return for all the follow-up visits is essential.

## List of Abbreviations

<b>Abbreviation</b>	<b>Meaning</b>
<b>WHO</b>	World health organization
<b>CSR</b>	Cataract surgery rate
<b>OPT</b>	Occupied Palestine territories
<b>PMPY</b>	per million per year
<b>ECCE</b>	Extracapsular cataract extraction
<b>VI</b>	Vision impairment
<b>NS</b>	Nuclear sclerosis
<b>DR</b>	Diabetic retinopathy
<b>AMD</b>	Age related macular degeneration
<b>PPA</b>	peripapillary atrophy
<b>DME</b>	Diabetic macular edema
<b>CRVO</b>	Central retinal vein occlusion
<b>DM</b>	Diabète mellitus
<b>HTN</b>	Hypertension
<b>CVD</b>	Cardiovascular disease
<b>CSME</b>	Clinically-significant macular edema
<b>PVD</b>	Posterior vitreous detachment
<b>RD</b>	Retinal detachment
<b>MVR</b>	Mitral valve regurgitation
<b>SLE</b>	Systemic lupus erythematosus
<b>COPD</b>	Chronic obstructive pulmonary disease
<b>CVA</b>	Cerebrovascular accident
<b>MSICS</b>	Manual small incision cataract surgery
<b>LMICs</b>	Low- and middle-income countries
<b>IOL</b>	Intraocular lens

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## Appendices

### Appendix 1

#### Socio-demographic Characteristics of Patient (N=353)

<b>Variable</b>	<b>Options</b>	<b>Frequency</b>	<b>Valid Present %</b>	<b>Missing</b>
Gender	Male	163	46.2	0
	Female	190	53.8	
Age categories	20- 29 years	3	0.85	0
	30 – 39 years	3	0.85	
	40 – 49 years	16	4.5	
	50 – 59 years	74	21.0	
	60 – 65 years	73	20.7	
	66 year or above	184	52.1	
Directorate	Nablus	108	41.2	91
	Ramallah and Al Bireh	2	0.8	
	Jenin	10	3.8	
	East Jerusalem	41	15.6	
	Salfit	1	0.4	
	Hebron	64	24.4	
	Bethlehem	9	3.4	
	Tubas	6	2.3	
	Tulkarm	7	2.7	
	Qalqilya	3	1.1	
	Jericho	11	4.2	

## Appendix 2

### Intra-operative cataract surgery information of patients in OPT.

<b>Variables</b>	<b>Options</b>	<b>Frequency</b>	<b>Valid percent</b>	<b>Missing</b>
<b>Operated Eye</b>	First eye	32	50.0	<b>289</b>
	Second eye	32	50.0	
<b>Surgery Type</b>	Phacoemulsification	305	86.4	<b>0</b>
	ECCE	48	13.6	
<b>Hospitalization</b>	Inpatient(one night)	2	0.6	<b>1</b>
	Outpatient	350	99.4	
<b>Type of Anesthesia</b>	General	26	7.9	<b>22</b>
	Sub-tenon	37	11.1	
<b>IOL Name</b>	Topical	268	81.0	<b>329</b>
	1 trufold	18	75.0	
<b>IOL Type</b>	2 excelnce	6	25.0	<b>328</b>
	Standard IOL	24	96.0	
<b>IOL Material</b>	Premium IOL (Multifocal, accommodating, toric)	1	4.0	<b>329</b>
	Hydrophobic acrylic IOL	24	100.0	

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	Complicated surgery	3	2.4	
<b>Operative Complications</b>	Vitreous complications	1	0.8	<b>230</b>
	No operative complications	119	96.8	

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### Appendix 3

#### Post-operative cataract surgery information of patients in OPT.

<b>Variables</b>	<b>Options</b>	<b>Frequency</b>	<b>Valid percent</b>	<b>Missing</b>
<b>Uncorrected</b>	Normal	177	68.6	
<b>POST-operative Distance</b>	Mild VI	56	21.71	
	Moderate VI	20	7.75	<b>95</b>
<b>Visual Acuity OU</b>	Severe VI	5	1.94	
	blindness	0	0	
<b>Best corrected post-operative Distance</b>	Normal	148	85.55	
	Mild VI	12	6.94	
	Moderate VI	7	4.04	<b>180</b>
<b>Visual Acuity OU</b>	Severe VI	0	0	
	blindness	0	0	
	N.A	6	3.47	

## Appendix 4

### Reported CSR per million population in nearby countries in the last decade

<b>Jordan</b>	<b>Low</b>	<b>1126</b>	<b>2006</b>
Lebanon	Low	1700	2006
Oman	In average	2401	2006
Syria	Low	1757	2006
Egypt	Low	692	2006
Saudi Arabia	Low	1671	2006
Iraq	Low	1187	2006
Kuwait	Low	1308	2006
Bulgaria	Low	1195	2006
Bahrain	In average	2175	2006
Qatar	Low	1036	2006
Iran	High	6328	2010
Romania	Low	1511	2006
Moldova	Low	700	2009
Libya	Low	1887	2006
Ukraine	Low	1222	2006
Eritrea	Low	1132	2006
Sudan	Low	289	2011

## Appendix 5

### Factors affecting CSR in several nations

Factor	Specific Factor	Sources
Demographical Factors	Age	
	Sex	
	Occupation	
	Education	
	Marital Status	
Economic Development	GPD	Israel, Iran etc....
Human Resources	Number of qualified Surgeons	
	Number of qualified residents	
	Number of scrub nurses	Royal college of optometrist  Must have two scrub nurses
	Number of outpatient nurses	Royal college of optometrist  Must have three
	A runner or health care assistant	Royal college of optometrist
	A patient Monitor	Royal college of optometrist

	Number of Optometrists	
	Number of surgeries per hour	Royal college of optometrist  *Non teaching unit: 2-2.5 cases/ hour
	Cat surgery training program availability	Royal college of optometrist  *Service cataract list vs teaching cataract list
	Anesthetist	
Surgical Infrastructure	Operation theater design	Operating microscope  Operating table/ surgery trolley/chair  Phacoemulsification machinery  Vitrectomy machinery  Bipolar cautery system  Resuscitation procedures & equipment
	Beds	
	Number of theater rooms	
	Minor or Major Center	Major means more than 1000-3000 surgeries per year

Surgical Quality	Hospitalization (outpatient vs inpatient surgery)	
	Type of anesthesia	
	Type of Cataract Surgery	
	Type of IOL	
	Quality of surgery	Preoperative examination ( VA& MR)  Biometry  Postoperative complications  Postoperative examination (VA & MR)
	Ocular co-morbidities	
	Type of Cataract	
Social Factors	Accessibility	
	Cost of surgery	Government health budgets and health insurance
	Population of each year	Ministry of Health

## Appendix 6

### Cataract surgery dependent and independent variables

Name	Type
<b>Dependent variables</b>	
<b>Cataract surgery rate(CSR)</b>	Numerical/ Continuous
<b>Independent variables</b>	
<b>Age</b>	Numerical/ Continuous
<b>Gender</b>	Dichotomous
<b>Place of origin</b>	Categorical/ Nominal
<b>Place of origin consideration</b>	Categorical/ Nominal
<b>Hospital directorate</b>	Categorical/ Nominal
<b>Hospital location</b>	Categorical/ Nominal
<b>Location consideration</b>	Categorical/ Nominal
<b>Type of facility</b>	Categorical/ Nominal
<b>Practice sector</b>	Categorical/ Nominal
<b>Cataract symptoms</b>	Categorical/ Nominal
<b>Uncorrected Pre-operative Distance Visual Acuity OD</b>	Numerical/ Continuous
<b>Uncorrected Pre-operative Distance Visual Acuity OS</b>	Numerical/ Continuous
<b>Best corrected Pre-operative Distance Visual Acuity OD</b>	Numerical/ Continuous

<b>Best corrected Pre-operative Distance Visual Acuity OS</b>	Numerical/ Continuous
<b>Cataract Type</b>	Categorical/ Nominal
<b>Pre-existing ocular comorbidities</b>	Categorical/ Nominal
<b>Complicated Surgery Risks</b>	Categorical/ Nominal
<b>Operated Eye</b>	Categorical/ Nominal
<b>Surgery Type</b>	Categorical/ Nominal
<b>Hospitalization</b>	Categorical/ Nominal
<b>Type of Anesthesia</b>	Categorical/ Nominal
<b>IOL Name</b>	Categorical/ Nominal
<b>IOL Type</b>	Categorical/ Nominal
<b>IOL Material</b>	Categorical/ Nominal
<b>Pre-op diseases</b>	Categorical/ Nominal
<b>Operative Complications</b>	Categorical/ Nominal
<b>Uncorrected Post-operative Distance Visual Acuity OD</b>	Numerical/ Continuous
<b>Best corrected Post-operative Distance Visual Acuity OD</b>	Numerical/ Continuous
<b>Uncorrected Post-operative Distance Visual Acuity OS</b>	Numerical/ Continuous
<b>Best corrected Post-operative Distance Visual Acuity OS</b>	Numerical/ Continuous

<b>Post-op Complications</b>	Categorical/ Nominal
<b>Numbers of ophthalmologists</b>	Numerical/ Discrete
<b>Number of optometrists</b>	Numerical/ Discrete
<b>Number of nurses assisting during cataract surgery</b>	Numerical/ Discrete
<b>Number of qualified residents</b>	Numerical/ Discrete
<b>Estimate of Number of cataract surgeries per week</b>	Numerical/ Continuous
<b>Numbers of cataract surgery rooms</b>	Numerical/ Discrete
<b>Availability of beds</b>	Categorical/ Nominal
<b>Numbers of cataract surgery beds</b>	Numerical/ Discrete
<b>Estimate of Number of inpatients after cataract surgery</b>	Numerical/ Discrete
<b>Type of anesthesia</b>	Categorical/ Nominal
<b>Report of 4s</b>	Categorical/ Nominal
<b>Quality of cataract surgery and evaluation of vision following cataract surgery</b>	Categorical/ Ordinal
<b>Post-operative instructions and medication schedule</b>	Categorical/ Nominal
<b>Name of prescribed medications</b>	Categorical/ Nominal
<b>Post-operative follow up schedule</b>	Categorical/ Nominal
<b>Cost of surgery</b>	Numerical/ Continuous

<b>Insurance</b>	Categorical/ Nominal
<b>Financial aids</b>	Categorical/ Nominal
<b>Most common type of cataract surgery</b>	Categorical/ Nominal

## Appendix 7

### Data abstraction sheet for the head of surgical hospital

المركز:	المحافظة:	التاريخ:/اسم المشفى
1.	عدد اطباء العيون المؤهلين لإجراء عملية ازالة المياه البيضاء في المشفى	
2.	عدد اخصائي البصريات لديك في المشفى	
3.	عدد الممرضين/ات المساعدين/ات خلال عملية ازالة المياه البيضاء	
4.	كم تقدر عدد عمليات المياه البيضاء التي يتم إجراءها أسبوعياً بالمشفى	
5.	عدد غرف عمليات ازالة المياه البيضاء في المشفى	
6.	هل تتوفر خدمات للمرضى إذا احتاجوا البقاء في المستشفى؟  إذا كانت اجابتكم لا الرجاء الانتقال إلى سؤال 10 مباشرة	
7.	هل يوجد أسرة في المشفى في حال احتاج المريض للبقاء في المشفى؟  إذا كانت الإجابة لا الرجاء الانتقال إلى السؤال 10 مباشرة	
8.	عدد الاسرة المتوفرة لديك في المشفى	
9.	كم يقدر عدد المرضى الذين يبقون في المشفى بعد العملية أسبوعياً	
10.	ما هو نوع التخدير المستخدم في عمليات المياه البيضاء؟	كلي موضعی
11.	تقرير عمل عملية ازالة المياه البيضاء يعتمد على  اعتتماداً على تأثيرها على نظر المريض  غير ذلك اكتشافها مجرد	
12.	هل تزودون المرضى بتعليمات مكتوبة وجدول أدوية بعد العملية؟  إذا كانت الإجابة لا الرجاء الانتقال إلى السؤال 14 مباشرة	
13.	ما هي اسماء الادوية التي توصف لهم	

لا	نعم	هل هناك برنامج متابعة للمرضى بعد القيام بعملية المياه البيضاء؟	14
		كم تبلغ تكلفة عملية المياه البيضاء في المشفى؟	15
لا	نعم	هل يقبل المشفى التأمين:  -الخاص?  -الحكومي  -العسكري  -غير ذلك	16
		هل يقدم المشفى مساعدة مالية/ خصم للمريض اذا لم يكن يحمل تأمين؟	17
		ما هو نوع عملية ازالة المياه البيضاء الاكثر اتباعاً في المشفى؟	18

## Appendix 8

### Patients Records Questionnaire

<b>Institution Information</b>	<b>Institution Code</b>
1. <b>Institution Name (Institute) &amp; Acronym</b>	
2. <b>Phone Number</b>	
3. <b>Date Collection Date</b>	
4. <b>Specify exact name of city, village or town etc</b>	
5. <b>Select Directorate where institute is located: (Direct)</b>	<input type="checkbox"/> Nablus (N) <sup>1</sup> <input type="checkbox"/> Ramallah and Al-Bireh (R&A) <sup>2</sup> <input type="checkbox"/> Jenin (JN) <sup>3</sup> <input type="checkbox"/> East Jerusalem (EJ) <sup>4</sup> <input type="checkbox"/> Salfit (S) <sup>5</sup> <input type="checkbox"/> Hebron (H) <sup>6</sup> <input type="checkbox"/> Bethlehem (B) <sup>7</sup> <input type="checkbox"/> Tubas (TB) <sup>8</sup> <input type="checkbox"/> Tulkarm (TK) <sup>9</sup> <input type="checkbox"/> Qalqilya (Q) <sup>10</sup> <input type="checkbox"/> Jericho (JC) <sup>11</sup> <input type="checkbox"/> Other <sup>12</sup>
6. <b>Select exact location of institute: (Loc)</b>	<input type="checkbox"/> City <sup>1</sup> <input type="checkbox"/> Town <sup>2</sup> <input type="checkbox"/> Village <sup>3</sup> <input type="checkbox"/> Refugee Camp <sup>4</sup> <input type="checkbox"/> Other <sup>5</sup> : Specify
7. <b>Is the location of institute considered urban or rural? (IUR)</b>	<input type="checkbox"/> Urban <sup>1</sup> <input type="checkbox"/> Rural <sup>2</sup>

	<input type="checkbox"/> Others <sup>3</sup> <i>Specify:</i>
8. <b>Type of Facility (FacType)</b> <i>You can select more than</i>	<input type="checkbox"/> Hospital <sup>1</sup> <input type="checkbox"/> University Hospital <sup>2</sup> <input type="checkbox"/> Other: Specify <sup>3</sup>
9. <b>Practice Sector (Sector)</b> <i>You can select more than one</i>	<input type="checkbox"/> Governmental <sup>1</sup> <input type="checkbox"/> Non-Profit      Governmental Organization <sup>2</sup> <input type="checkbox"/> Civil <sup>3</sup> <input type="checkbox"/> Private (For profit) <sup>4</sup> <input type="checkbox"/> Private group practice (For profit) <sup>5</sup> <input type="checkbox"/> UNRWA <sup>6</sup> <input type="checkbox"/> Other: Specify <sup>7</sup>
<b>Cataract Surgery Information</b>	<b>Chart Code</b>
<b>Patient Demographics</b>	
1. <b>Place of Origin (POO)</b>	<input type="checkbox"/> Nablus (N) <sup>1</sup> <i>Specify:</i> <input type="checkbox"/> Ramallah and Al Bireh (R&A) <sup>2</sup> <i>Specify:</i> <input type="checkbox"/> Jenin (JN) <sup>3</sup> <i>Specify:</i> <input type="checkbox"/> East Jerusalem (EJ) <sup>4</sup> <i>Specify:</i> <input type="checkbox"/> Salfit (S) <sup>5</sup> <i>Specify:</i> <input type="checkbox"/> Hebron (H) <sup>6</sup> <i>Specify:</i> <input type="checkbox"/> Bethlehem (B) <sup>7</sup> <i>Specify:</i> <input type="checkbox"/> Tubas (TB) <sup>8</sup> <i>Specify:</i> <input type="checkbox"/> Tulkarm (TK) <sup>9</sup> <i>Specify:</i> <input type="checkbox"/> Qalqilya (Q) <sup>10</sup> <i>Specify:</i> <input type="checkbox"/> Jericho (JC) <sup>11</sup> <i>Specify:</i> <input type="checkbox"/> Other <sup>12</sup> :
2. <b>Is your place of Origin located in urban or rural (POOUR)</b>	<input type="checkbox"/> Urban <sup>1</sup> <input type="checkbox"/> Rural <sup>2</sup>

	<input type="checkbox"/> Others <sup>3</sup> Specify:
3. Gender	<input type="checkbox"/> Male <sup>1</sup> <input type="checkbox"/> Female <sup>2</sup>
4. Age	<input type="checkbox"/> 20-29 <sup>1</sup> <input type="checkbox"/> 30-39 <sup>2</sup> <input type="checkbox"/> 40-49 <sup>3</sup> <input type="checkbox"/> 50-59 <sup>4</sup> <input type="checkbox"/> 60-65 <sup>5</sup> <input type="checkbox"/> >65 <sup>6</sup>
<b>Pre-Operative Cataract Information</b>	
Cataract symptoms	<input type="checkbox"/> Glare <sup>1</sup> <input type="checkbox"/> Blur <sup>2</sup> <input type="checkbox"/> No symptoms listed <sup>3</sup> <input type="checkbox"/> Others <sup>4</sup> Specify:
Uncorrected Pre-operative Distance Visual Acuity OD	
Uncorrected Pre-operative Distance Visual Acuity OS	
Best corrected Pre-operative Distance Visual Acuity OD	
Best corrected Pre-operative Distance Visual Acuity OS	
Cataract Type	<input type="checkbox"/> Nuclear sclerosis <sup>1</sup> <input type="checkbox"/> Cortical cataract <sup>2</sup> <input type="checkbox"/> Posterior subcapsular cataract <sup>3</sup> <input type="checkbox"/> Others <sup>4</sup> Specify:
Pre-existing ocular comorbidities	<input type="checkbox"/> Glaucoma <sup>1</sup> <input type="checkbox"/> AMD <sup>2</sup> <input type="checkbox"/> DR <sup>3</sup> <input type="checkbox"/> Uveitis <sup>4</sup>

	<input type="checkbox"/> DR <sup>5</sup> <input type="checkbox"/> Others <sup>6</sup> Specify: 
<b>Complicated Surgery Risks</b>	<input type="checkbox"/> None present <sup>1</sup> <input type="checkbox"/> Previous corneal refractive surgery <sup>2</sup> <input type="checkbox"/> Previous vitreous surgery <sup>3</sup> <input type="checkbox"/> Small pupil <sup>4</sup> <input type="checkbox"/> Dense cataract <sup>5</sup> <input type="checkbox"/> Cornel opacities <sup>6</sup> <input type="checkbox"/> Others <sup>7</sup> Specify: <input type="checkbox"/> Not specified <sup>8</sup>
<b>Intra-Operative Cataract Surgery Information</b>	
<b>Surgery Date</b>	
<b>Discharge Date:</b>	
<b>Operated Eye</b>	<input type="checkbox"/> First eye surgery <sup>1</sup> <input type="checkbox"/> Second eye surgery <sup>2</sup> <input type="checkbox"/> Same day bilateral cataract surgery <sup>3</sup> <input type="checkbox"/> Others <sup>4</sup> Specify:
<b>Surgery Type</b>	<input type="checkbox"/> Phacoemulsification (PEIOL) <sup>1</sup> <input type="checkbox"/> Extracapsular Cataract Extraction (ECCE) <sup>2</sup> <input type="checkbox"/> Intracapsular Cataract Extraction (ICCE) <sup>3</sup> <input type="checkbox"/> Lensectomy <sup>4</sup> <input type="checkbox"/> Small Incision Cataract Surgery (SICS) <sup>5</sup> <input type="checkbox"/> Others <sup>6</sup> Specify:
<b>Hospitalization</b>	<input type="checkbox"/> Inpatient (1 night) <sup>1</sup> <input type="checkbox"/> Inpatient (More than 1 night) <sup>2</sup> <input type="checkbox"/> Out-patient <sup>3</sup>

	<input type="checkbox"/> Unspecified <sup>4</sup>
<b>Type of Anesthesia</b>	<input type="checkbox"/> General <sup>1</sup> <input type="checkbox"/> Retrobulbar <sup>2</sup> <input type="checkbox"/> Peribulbar <sup>3</sup> <input type="checkbox"/> Sub-tenon <sup>4</sup> <input type="checkbox"/> Topical <sup>5</sup> <input type="checkbox"/> Topical Intracameral <sup>6</sup> <input type="checkbox"/> Others <sup>7</sup> Specify:
<b>IOL Name</b>	<input type="checkbox"/> Specify <sup>1</sup> : <input type="checkbox"/> Unspecified <sup>2</sup>
<b>IOL Type</b>	<input type="checkbox"/> Np premium IOL <sup>1</sup> <input type="checkbox"/> Premium IO (Multifocal, accommodating, toric) <sup>2</sup> <input type="checkbox"/> Unspecified <sup>3</sup> <input type="checkbox"/> Others <sup>4</sup> Specify
<b>IOL Material</b>	<input type="checkbox"/> Hydrophobic acrylic IOL <sup>1</sup> <input type="checkbox"/> Hydrophilic acrylic IOL <sup>2</sup> <input type="checkbox"/> Silicone IOL <sup>3</sup> <input type="checkbox"/> Others specify <sup>4</sup> : <input type="checkbox"/> Unspecified <sup>5</sup>
<b>Operative Complications</b>	<input type="checkbox"/> incision complications <sup>1</sup> ,specify: <input type="checkbox"/> Anterior Segment complications <sup>2</sup> , specify: <input type="checkbox"/> Capsule Complications <sup>3</sup> , specify: <input type="checkbox"/> Nucleus complications <sup>4</sup> , specify: <input type="checkbox"/> Iris complications <sup>5</sup> , specify <input type="checkbox"/> IOL complications <sup>6</sup> , specify: <input type="checkbox"/> Retinal complications <sup>7</sup> , specify:

	<input type="checkbox"/> Others (please specify) <sup>8</sup> <input type="checkbox"/> No operative complications reported <sup>9</sup>
<b>Post-Op Examination</b>	
<b>Uncorrected Post-operative Distance Visual Acuity OD</b>	
<b>Best corrected Post-operative Distance Visual Acuity OD</b>	
<b>Uncorrected Post-operative Distance Visual Acuity OS</b>	
<b>Best corrected Post-operative Distance Visual Acuity OS</b>	
<b>Post-op Complications</b>	<input type="checkbox"/> incision complications <sup>1</sup> , specify: <input type="checkbox"/> Anterior Segment complications <sup>2</sup> , specify: <input type="checkbox"/> Capsule Complications <sup>3</sup> , specify: <input type="checkbox"/> Nucleus complications <sup>4</sup> , specify: <input type="checkbox"/> Iris complications <sup>5</sup> , specify <input type="checkbox"/> IOL complications <sup>6</sup> , specify: <input type="checkbox"/> Retinal complications <sup>7</sup> , specify: <input type="checkbox"/> Others (please specify) <sup>8</sup> <input type="checkbox"/> No operative complications reported <sup>9</sup>
<b>Additional Notes:</b>	

## **Appendix 9**

### **Consent Form**

#### **Verbal consent form statement**

#### **English Edition**

You are invited to give permission to use the files of your patients who have undergone cataract surgery in the hospital in order to conduct a scientific research project titled "The rate of cataract operations in the West Bank" at An-Najah National University in Nablus.

This research is related to all patients who underwent cataract surgery in the West Bank in the years 2019 and 2020.

There are no negative side effects associated with the use of patient files in this study.

One of the benefits of this research is that we know the rate of cataract operations in the West Bank and whether their number is sufficient or not to cover the patients' needs for this operation according to the standards of the World Health Organization. As a result, we can present our findings to decision-makers in order for them to take practical steps to make these operations more accessible to patients in need, increase their number and efficiency in the West Bank, and reduce reversible blindness caused by cataract.

If you agree to share your patient files in this study, the information gathered will be kept strictly confidential. Any information about patients will be saved as a number rather than the patient's name. Except for the project supervisor dr. Hala Labadi, no one will be able to access or share this information. The information we will obtain from the files is strictly confidential and will only be used for scientific research.

### الجزء الأول: نموذج الموافقة

أنت مدعو(ة) لإعطاء الموافقة على استخدام ملفات المرضى الذين خضعوا لعملية إزالة المياه البيضاء لديك في المستشفى من أجل إجراء بحث علمي الذي سيجري في جامعة النجاح الوطنية في نابلس بعنوان "معدل عمليات إزالة المياه البيضاء عادة العين" في الضفة الغربية". الرجاء أن تأخذ(ي) الوقت الكافي لقراءة المعلومات التالية بشأن قبل أن تقرر(ي) إذا كنت تزيد(ين) مشاركة ملفات مرضاك أم لا. بإمكانك طلب أي تصريحات أو معلومات إضافية عن أي شيء ذكر في هذه الاستماراة أو عن هذه الدراسة كل من الباحثين.

هذا البحث يتعلق بجميع المرضى الذين أجروا عملية إزالة المياه البيضاء من عدسة العين في عامي 2019 و 2020 بالضفة الغربية، بحيث سيتم جمع ملفات المرضى الذين خضعوا لعملية إزالة المياه البيضاء بالضفة الغربية في الفترة المحددة وجمع المعلومات الموجودة بملفاتهم المتعلقة بهذه العملية بهدف حساب معدل عمليات إزالة المياه البيضاء في الضفة الغربية، وبالتالي معرفة إن كان هناك أي نقص في معدل العمليات اللازمة للحد من العمى الناتج عن المياه البيضاء في عدسة العين.

هذا البحث لا يحوي على أي تأثيرات جانبية سلبية التي من الممكن أن تحدث خلال استخدام ملفات المرضى.

من فوائد هذا البحث أن نعرف ما هو معدل عمليات إزالة المياه البيضاء في الضفة الغربية وان كان عددها كافي أم لا لتغطية حاجات المرضى لهذه العملية حسب معايير منظمة الصحة العالمية

العالمية وبالتالي يمكننا أن نقدم نتائجنا الصناعي القرار للقيام بخطوات عملية لتسهيل اجراء هذه العمليات للمرضى المحتاجين لها وزيادة عددها وكفاءتها في الضفة الغربية والحد من العمى الذي يمكن علاجه الناتج عن المياه البيضاء.

في حال وافقت على مشاركة ملفات المرضى في هذه الدراسة، المعلومات التي سيتم جمعها في هذا البحث العلمي سيتم الاحتفاظ بها بشكل سري. وأية معلومة عن المرضى سوف تحفظ على شكل رقم وليس اسم المريض. لن يستطيع أي أحد الوصول على هذه المعلومات أو مشاركتها مع أحد آخر غير مشرف المشروع د. هلا اللبدي. أنت غير مجبور على الاشتراك بالبحث وبإمكانك ترك البحث في أي وقت تشاء بدون ابداء الاسباب. المعلومات التي سوف تأخذها من الملفات سرية ولن تستخدم الا لغرض البحث العلمي.

خلال هذا البحث نريد موافقة رئيس المشفى او لاً ورئيس قسم العيون ثانياً.

## الجزء الثاني : موافقة الباحث:

لقد شرحت بالتفصيل للمشترك في البحث العلمي ل \_\_\_\_\_ (اسم المشترك) طبيعته ومبرياته وتأثيراته السلبية. ولقد أجبت على كل أسئلته بوضوح على خير ما أستطيع. وسوف أعلم المشترك بأي تغييرات في مجريات هذا البحث أو تأثيراته السلبية أو فوائده في حال حصولها أثناء البحث.

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إسم الباحث او الشخص المولى الحصول على موافقة المشترك  
المولى

الحصول على موافقة المشترك

التاريخ:

### موافقة رئيس المشفى او رئيس قسم العيون:

لقد قرأت استماراة القبول هذه وفهمت مضمونها. تمت الأجابة على أسئلتي جميعها. وبناء عليه فأنتي، حرا مختاراً،  
أجيز إجراء هذا البحث وأوافق على الإشتراك فيه، وإنني أعلم ان الباحث \_\_\_\_\_ وزملاءه  
ومعاونيه او مساعديه سيكونون مستعدين للإجابة على أسئلتي، وأنه باستطاعتي الإتصال بهم . كما أعرف تمام  
المعرفة بأنني حر في الإنسحاب من هذا البحث متى شئت حتى بعد التوقيع على الموافقة دون ان يؤثر ذلك على العناية  
الطيبة المقدمة لي. أعلم أنني سوف أحصل على نسخة طبق الأصل عن هذه الموافقة.

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إسم المشترك

توقيع المشترك

التاريخ:

إسم الشاهد (إذا كان المشترك أو الوصي أميا)

توقيع الشاهد



جامعة النجاح الوطنية  
كلية الدراسات العليا

معدل عمليات الساد في مراكز العيون في فلسطين المحتلة:

دراسة بأشهر رجعي

إعداد

رؤى فايز ربع

إشراف

د. هلا اللبدي

قدمت هذه الرسالة استكمالاً لمتطلبات الحصول على درجة الماجستير في الصحة العامة، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس - فلسطين.

2022

# **معدل عمليات الساد في مراكز العيون في فلسطين المحتلة: دراسة بأثر رجعي**

إعداد

رؤى فايز ربع

إشراف

د. هلا اللبدي

## **الملخص**

**المقدمة:** يعتبر الساد السبب الرئيسي للعمى الذي يمكن علاجه في العالم، لذلك فإيجاد معدل عمليات الساد يعد من أهم الأسباب للتقليل من العمى وضعف الرؤية الناجمين عن الساد.

**هدف الدراسة:** تهدف هذه الدراسة إلى إيجاد معدل عمليات الساد في الضفة والقدس، بالإضافة إلى معرفة نتائج هذه العملية وخدمات المستشفيات لتوفير هذه العملية للمرضى، بحيث تناولت هذه الدراسة جميع مستشفيات العيون في الضفة الغربية والقدس.

**أسلوب البحث والطريقة:** إن هذه الدراسة هي دراسة مقطعة لقطاع العيون وهي أحدى توصيات منظمة الصحة العالمية للتقليل من نسبة العمى الذي يمكن علاجه في العالم، حيث تم عمل هذه الدراسة على مستوى مدن الضفة الغربية والقدس الشرقية وتمت الدراسة من خلال تعبئة استبيانات من خلال المقابلات الشخصية مع الكوادر الطبية بالإضافة إلى أخذ بيانات من سجلات المرضى الذين أجروا هذه العملية في عام 2019 م.

**النتائج:** بلغ عدد عمليات الساد عام 2019 م في الضفة والقدس 2297 عملية لكل مليون نسمة، بينما بلغ عدد العمليات عام 2020 م حوالي 1885 عملية لكل مليون نسمة وكل منها يعتبر أقل من الحد الأدنى لعدد العمليات الموصى به من قبل منظمة الصحة العالمية.

نتائج عمليات الساد في الضفة والقدس قريبة جداً من النتائج الموصى بها من قبل منظمة الصحة العالمية، حيث بلغت نسبة عدد المرضى الذين يملكون نتائج حدة بصر جيدة بعد العملية مع التصحيح المناسب ما يقارب 93.8%, أما نتائج النظر السيئة بلغت 0.95%, وأخيراً النتائج المتوسطة شكلت نسبة 5.21% وهي النتيجة الوحيدة التي

كانت أعلى قليلاً من الحد الأعلى للنسبة الموصى بها من قبل منظمة الصحة العالمية لنتائج عمليات الساد المرضية والتي توصي بأن تكون نسبة المرضى الذين تكون نتائج نظرهم متوسطة بعد العملية مع التصحيح اللازم أقل من . %5

**الخلاصة:** نوصي بزيادة عدد عمليات الساد في المستشفيات وتشجيع المرضى على عمل هذه العملية، بالإضافة إلى دراسة عدد المرضى الذين يجب عليهم عمل هذه العملية ولم يعلموها والأسباب التي تدفعهم إلى ذلك.