

# JOURNAL OF HEALTH & TRANSLATIONAL MEDICINE

# JUMMEC

Volume 23 ■ Suppl 1 ■ August 2020

EVALUATION OF SECONDARY SCHOOL STUDENT'S OUTDOOR THERMAL COMFORT DURING PEAK URBAN HEATING HOURS IN GREATER KUALA LUMPUR

Fong CS, Agahrohmahadi N, Ramakrishnan L, Sulaiman NM

SELF-MANAGEMENT FACTORS RELATED TO HOTELS' AND NIGHTCLUBS' COMPLIANCE WITH LOCAL REGULATION (PERDA) ON SMOKE-FREE ENVIRONMENTS (SFE) IN BOGOR CITY

Asyary A, Veruswati M

PREVALENCE AND ASSOCIATED FACTORS OF DEPRESSION AMONG PARENTS WITH LOW SOCIO-ECONOMIC STATUS IN THE COMMUNITY IN KUALA LUMPUR, MALAYSIA

Yakub NA, Abdul Kadir NB, Mohd Hoesni S

INDONESIA TOWARDS UNIVERSAL HEALTH COVERAGE: LESSONS FROM ASEAN COUNTRIES

Trisnowati AD, Wulandari RD

ENDOTOXIN EXPOSURE AND LUNG FUNCTION AMONG RICE MILLERS IN MALAYSIA

Md Shabri SF, Anna SM, Sofian S, Mohamad Asri AA

VALIDATION OF THE COPSOQ AND BWD-24 AS A JOB DEMAND SCALE FOR ASSESSING TAXI DRIVERS' SAFETY PERFORMANCE: SPECIFIC VS. GENERAL JOB DEMANDS

Husain NA, Mohamad J

HOSPITAL NURSES' PSYCHOLOGICAL CAPITAL AND WORK ENGAGEMENT - ARE THEY REALLY RELATED? THE CASE OF AN INDONESIAN HOSPITAL

Percuda AD, Nuzulul KP

EXPOSURE OF AFLATOXIN B<sub>1</sub> (AFB<sub>1</sub>) IN INHALABLE DUST AND ITS RESPIRATORY EFFECTS AMONG RICE MILLERS

Mohamad Asri AA, Anna SM, Sofian S, Md Shabri SF

FEASIBILITY STUDY ON THE DEVELOPMENT OF THE HEMODIALYSIS SERVICES AT XV TEACHING HOSPITAL

Rochmah TN, Rochtiati, Madi Arabi ID

SERVICE EXPERIENCE BY THE BUGIS ETHNIC ON HEALTH SERVICES PROVIDED IN PUBLIC HOSPITALS IN SOUTH SULAWESI

Armin, Maidin A, Sifin I, Rivai F, Soediharn O, Rizki F

CONSTRAINTS IN WAITING TIME OF HOSPITAL PHARMACY SERVICES

Jannah LM, Seruni ENHP, Rochmah TN

ASSESSING NURSES' SATISFACTION ON THEIR WORK-SCHEDULES: THE CASE OF A HOSPITAL IN JAKARTA

Rizany I, Sri Hariyati RT, Aisyanti E

ROOT CAUSES OF MEDICATION ERRORS IN THE PHARMACY UNIT OF A MENTAL HOSPITAL IN INDONESIA

Hasna R, Rochmah TN, Cahya MS

THE COMPLIANCE OF CLINICAL PATHWAY ON CLINICAL SUPERVISION IN DECREASING THE LENGTH OF STAY FOR PATIENTS UNDERGOING MASTECTOMY AT AN ACADEMIC HEALTH CENTRE

Almad AM, Djamly C, Dessak GAS, Erwin AT, Ely L, Ajeng IP

CULTURAL-PSYCHOLOGICAL ELEMENTS AND ACHIEVEMENT OF MINIMUM SERVICE STANDARDS IN ISLAMIC HOSPITAL SURABAYA

Infrani R, Masmul KP, Budhi S

EVALUATION OF DIPHThERIA SURVILLANCE SYSTEM IN KEDIRI REGENCY, EAST JAVA PROVINCE

Rizany I, Kartika BW, Wahyuni CU, Irfanah

DETERMINANTS ON THE UTILIZATION OF INSTITUTIONAL DELIVERY IN RURAL AREAS OF MYAING TOWNSHIP, MAGWAY REGION, MYANMAR

Aung T, Kyaw-Co A, Genter AF, Liabustrakul T, Ko MK

THE INFLUENCE OF SEAMLESS AND COMPLETENESS DISCHARGE SUMMARY FILLING TO SUITABILITY OF SEVERITY LEVEL IN TERTIARY REFERRAL HOSPITAL

Hapsari DF, Cholidyanto D, Wahyubadi J

PATIENT PERCEPTIONS ABOUT CUSTOMER-CENTRIC IN THE EXECUTIVE AMBULATORY POLYCLINICS IN HERMINA DEPOK HOSPITAL, INDONESIA

Agustiani NK, Sulfitriadi W, Asyary A, Purwadi AG

THE EFFECT OF HOSPITAL SERVICE QUALITY ON INPATIENT SATISFACTION IN PIRU HOSPITAL

Ernaswati, Supriyanto S, Krubianto, Vismah

HEALTHY CITY AWARDS IN SOUTH SULAWESI, INDONESIA: EXPECTATIONS AND CHALLENGES

Pahutari S, Aenandi A

THE IMPACT OF DOCTORS-NURSES COLLABORATION ON CLINICAL PATHWAY COMPLIANCE IN INPATIENT DEPARTMENT AT AN INDONESIAN PRIVATE HOSPITAL

Sitwanto M, Dharmanti I

AN EVALUATION OF THE IMPLEMENTATION OF THE ELDERLY HEALTH PROGRAM IN INDONESIA: A CASE STUDY

Reviati, Wulandari RD

EPIDEMIOLOGY POST-EARTHQUAKE DISEASES IN GANGGA SUBDISTRICT, NORTH LOMBOK, INDONESIA

Almira F, Hidayah AC

CONTRIBUTING FACTORS OF STUNTED GROWTH AMONG TODDLERS IN MAKASSAR CITY: A QUALITATIVE STUDY

Tubangsuca M, Amiruddin R, Anzariadi, Syam A

INDONESIAN HEALTHY AGING: SEEING OUR READINESS TO REALIZE HEALTHY AGING IN TERMS OF THE EXISTING POLICIES

Rohanaswati IT, Romadaniyoti R, Chibibijah W, Herlyuwati A, Reviati, Wulandari RD

THE PREVALENCE OF CYBERBULLYING AND ITS ASSOCIATED FACTORS AMONG YOUNG ADOLESCENTS IN PENANG, MALAYSIA

Sivathanes TV, Ahmad Zaki R, Choo WY

IMPROVING HAND HYGIENE COMPLIANCE THROUGH WHO'S MULTIMODAL HAND HYGIENE IMPROVEMENT STRATEGY

Bernaedeta M, Djamly Ch, Nikun S

IDENTIFYING THE FACTORS ASSOCIATED WITH EMERGENCY BOARDING TIME

Arminia AS, Yurisonan T, Prakeswati E

PREDICTION OF STAGE-BASED HUMAN IMMUNODEFICIENCY VIRUS (HIV) AND ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS) CASES IN SURABAYA FROM 2018 UNTIL 2022

Luthi FN, Fariani S

COST EFFECTIVENESS ANALYSIS BETWEEN SMALL INCISION CATARACT SURGERY AND PHACOEMULSIFICATION

Wulandari A, Dahlui M, Ernaswati, Wulandari RD, Rochmah TN

HEALTH LITERACY AMONG ADULT TYPE 2 DIABETES MELLITUS (T2DM) PATIENTS IN KIANG HEALTH DISTRICT MALAYSIA

Tan WY, Ismail M

SYSTEMATIC REVIEW OF LIFE COURSE SOCIAL DETERMINANTS OF HEALTH AND THEIR ASSOCIATION WITH ADULTHOOD METABOLIC SYNDROME

Mazuki MF, Eze T, A, Mahmud AB, Moy FM



**UNIVERSITY OF MALAYA**  
Faculty of Medicine



The University of Malaya, Kuala Lumpur, Malaysia hosted the APACPH-KL Early Career Global Public Health Conference: Implementation Science for Improving Population Health on the 11<sup>th</sup> and 12<sup>th</sup> of April, 2019. The two-day conference was officiated by APACPH-KL President, Yang Berbahagia Datuk Professor Awang Bulgiba Awang Mahmud. The conference gathered experts and researchers in public health for an exchange and expansion of knowledge and to share experiences on how to tackle public health issues, which are sometimes borderless.

Organized by Asia-Pacific Academic Consortium for Public Health Kuala Lumpur (APACPH-KL), in collaboration with the Centre for Population Health (CePH), the Department of Social and Preventive Medicine (SPM), Faculty of Medicine, University of Malaya, and the University of Airlangga; the conference aimed to leverage on the global public health education and research of Asia-Pacific universities to address global public health issues through interaction with public policy and media. It also hoped to develop and enhance the network amongst international fellow students and early career public health researchers.

The conference offered an excellent platform for early-career public health professionals and students to exchange ideas and network with regional public health thought leaders and researchers. The organizers succeeded in bringing people from the industry, academia, NGOs, and international organizations to make presentations and have interactive discussions. Participants made oral presentations on Health Systems and Policy, Epidemiology, Occupational and Environmental Health as well as Behavioural and Reproductive Health.

This conference hopes to build up the confidence of early-career public health professionals and postgraduate students in presenting and publishing articles in well-regarded peer-reviewed journals. It was also the perfect opportunity for them to network and interact with one another. APACPH-KL and the University of Malaya look forward to more of such activities being conducted in the near future.

Published: 2020-08-28

## Research article

### GUEST EDITORIAL: CORONAVIRUS (COVID-19) IS HERE TO STAY!

Wah Yun Low, Maznah Dahlui, Nur Asyikin Yakub, Fatin Diyana Abdul Aziz, Tri Martiana  
1 - 2

PDF

### EVALUATION OF SECONDARY SCHOOL STUDENT'S OUTDOOR THERMAL COMFORT DURING PEAK URBAN HEATING HOURS IN GREATER KUALA LUMPUR

Chng Saun Fong, Nasrin Aghamohammadi, Logaraj Ramakreshnan, Nik Meriam Sulaiman  
3 - 11

PDF

### SELF-MANAGEMENT FACTORS RELATED TO HOTELS' AND NIGHTCLUBS' COMPLIANCE WITH LOCAL REGULATION (PERDA) ON SMOKE-FREE ENVIRONMENTS (SFE) IN BOGOR CITY

Al Asyary, Meita Veruswati  
12 - 18

PDF

### PREVALENCE AND ASSOCIATED FACTORS OF DEPRESSION AMONG PARENTS WITH LOW SOCIO-ECONOMIC STATUS IN THE COMMUNITY IN KUALA LUMPUR, MALAYSIA

Nur Asyikin Yakub, Nor Baâ€™yah Abdul Kadir, Suzana Mohd Hoesni  
19 - 25

PDF

## INDONESIAN HEALTHY AGING: SEEING OUR READINESS TO REALIZE HEALTHY AGING IN TERMS OF THE EXISTING POLICIES

Indana Tri Rahmawati  
196 - 201

PDF

## THE PREVALENCE OF CYBERBULLYING AND ITS ASSOCIATED FACTORS AMONG YOUNG ADOLESCENTS IN PENANG, MALAYSIA

Thava Viknaraj Sivabalan, Rafdzah Ahmad Zaki, Choo Wan Yuen  
202 - 211

PDF

## IMPROVING HAND HYGIENE COMPLIANCE THROUGH WHO'S MULTIMODAL HAND HYGIENE IMPROVEMENT STRATEGY

Bernadetta Indah Mustikawati, Djazuly Chalidyanto, Niken Syitharini  
212 - 219

PDF

## IDENTIFYING THE FACTORS ASSOCIATED WITH EMERGENCY BOARDING TIME

Andri Sofa Armiani, Tito Yustiawan, Endang Prabawati  
220 - 225

PDF

## PREDICTION OF STAGE-BASED HUMAN IMMUNODEFICIENCY VIRUS (HIV) AND ACQUIRED IMMUNODEFICIENCY SYNDROME (AIDS) CASES IN SURABAYA FROM 2018 UNTIL 2022

Lutfi Fajar Nuraidah, Fariani Syahrul  
226 - 230

PDF

## COST EFFECTIVENESS ANALYSIS BETWEEN SMALL INCISION CATARACT SURGERY AND PHACOEMULSIFICATION

Anggun Wulandari, Maznah Dahlui, Ernawaty., Ratna Dwi Wulandari, Thinni Nurul Rochmah  
231 - 237

PDF

## HEALTH LITERACY AMONG ADULT TYPE 2 DIABETES MELLITUS (T2DM) PATIENTS IN KLANG HEALTH DISTRICT MALAYSIA

Tan Wen Yi, Maslinor Ismail  
238 - 246

PDF

## SYSTEMATIC REVIEW OF LIFE COURSE SOCIAL DETERMINANTS OF HEALTH AND THEIR ASSOCIATION WITH ADULTHOOD METABOLIC SYNDROME

Mohammad Fadzly Marzuki, Awang Bulgiba Awang Mahmud, Kew Yueting, Moy Foong Ming  
247 - 258

PDF

---

**Editor-in-Chief**

Lau Yee Ling, BSc, MMedSc, PhD

**Founding Editor**

Khairul Anuar Abdullah, MPH, PhD

**Senior Editor**

Tunku Kamarul Zaman, MD, MS Ortho, PhD

**Assistant Editors**

Amirah Binti Amir, MBBS, PhD

Cheong Fei Wen, BBMedSc, PhD

**Editors (University of Malaya)**

Ivy Chung, BEng, PhD

Debra Sim Si Mui, BSc, PhD

Azlina Amir Abbas, MD, AdvDipMed Sci, MS Ortho

Kiew Lik Voon, BBioMedSc, MSc (Pharm), PhD

Wong Pooi Fong, BBioMedSc, DipTropMed, MMedSc, PhD

Anwar Norazit, BBMedSc, MMedSc, PhD

Suzita Mohd Noor, BBMedSc, MMedSc, PhD

Thamil Selvee A/P Ramasamy, BSc, PhD

Victor Hoe Chee Wai Bin Abdullah, MBBS, MPH, MPH(OH), MEng(SHE), PhD

Noor Azlin Yahya, MDenSci, BDS, DipTra

Tan Choo Hock, MBBS, PhD

Wong Li Ping, BSc, MMedSc, PhD

Tan Ai Huey, MD, MRCP

Retnagowri A/P Rajandram, BSc, PhD

Kamariah Binti Ibrahim, BSc, MMedSc, PhD

Muhammad Fazril Bin Mohamad Razif, BSc, PhD

Tengku Ain Fathlun Binti Tengku Kamalden, MBBS, MRCSEd, MRCOphth, MMed (Ophth), PhD

Wong Kah Hui, BSc, MSc, PhD

Farhana Binti Fadzli, MBChB, MRad

Anand A/L Sanmugam, MD, MSurger

Nadia Binti Atiya, MB, BCh, BAO, BMedSci, MPath

Vinod Pallath, BSc, MSc, PhD

Mazlina Mazlan, MBBS, MRehabMed

Nur Musfirah Mahmud, Bsc, PhD

Nur Musfirah Mahmud, Bsc, PhD

Fong Si Lei, MBBS, MRCP

#### **International Editors**

Ilyas Khan, Swansea University, United Kingdom

John Fairclough, Cardiff Metropolitan University, United Kingdom

Simon Frostick, University of Liverpool, United Kingdom

Mohammed Mahdy, Sana'a University, Yemen

David Tai Wei Leong, National University of Singapore, Singapore

Bruce Russell, University of Otago, New Zealand

Hesham M. Al-Mekhlafi, Jazan University, Kingdom of Saudi Arabia

Kai Ling Liang, Ghent University, Belgium

Chia-Ching (Josh) Wu, National Cheng Kung University, Taiwan

#### **Advisory Board**

David Chiu-Yin Kwan, China Medical University, Taiwan

Wilfred Peh, Singapore Medical Association, Singapore

Aw Tar-Ching, United Arab Emirates University, United Arab Emirates

Omar Kasule, King Fahad Medical City, Saudi Arabia

Parveen June Kumar, Queen Mary University of London, United Kingdom

Jeong-Wook Seo, Seoul National University Hospital, Korea

Looi Lai Meng, University of Malaya, Malaysia

#### **Language Editors**

Gracie Ong @ Gracie Ong Siok Yan

Geh Sooi Lin

Rohela Mahmud

Zahurin Mohamme

M.S. Kanthimathi

Hamimah Hj. Hassan

Yong Hoi Sen

Ruby binti Husain

#### **Past Chief Editors**

Tunku Kamarul Zaman, MD, MS Ortho, PhD

Mohd Rais Mustafa, BSc, PhD

Rosmawati Mohamed, MBBS, MRCP, M. Med, MD

Khairul Anuar Abdullah, MPH, PhD

#### **Past Editor**

Atiya Abdul Sallam, MPH, MSc, PhD

## COST EFFECTIVENESS ANALYSIS BETWEEN SMALL INCISION CATARACT SURGERY AND PHACOEMULSIFICATION

Wulandari A<sup>1</sup>, Dahlui M<sup>2,3</sup>, **Ernawaty<sup>3</sup>**, Wulandari RD<sup>3</sup>, Rochmah TN<sup>3</sup>

<sup>1</sup>Faculty of Medicine, Universitas Lambung Mangkurat, South Kalimantan, Indonesia

<sup>2</sup>Centre of Population Health, Dept. of Social and Preventive Medicine, Faculty of Medicine, University of Malaya, Malaysia

<sup>3</sup>Faculty of Public Health, Universitas Airlangga, Surabaya, Indonesia

### Corresponding author:

Thinni Nurul Rochmah

Faculty of Public Health, Universitas Airlangga,

60115 Surabaya, East Java, Indonesia

Email: thinni\_nurul@fkm.unair.ac.id

### Abstract

**Background:** Cataract is the second priority eye disease in the world and this case in Indonesia occupies the third-highest position in Southeast Asia. There are two methods for cataract treatment that can be expensive, small incision method (SICS) and Phacoemulsification method, and it is important to know the cost-effective comparison of those two methods.

**Objective:** This study aims to conduct Cost-Effectiveness Analysis (CEA) between cataract surgery; Small Incision Cataract Surgery (SICS) and Phacoemulsification, at Undaan Eye Hospital Surabaya.

**Materials and Method:** A prospective study following up patients from before surgery up to 21 days' post surgery. A total of 155 cataract patients had undergone surgery; 25 patients and 130 patients had SICS and Phacoemulsification, respectively. Quality-Adjusted Life Years (QALYs) was used as the outcome measure. The assessment of utility using 'Visual Function 25' (VF-25) was the quality of life regarding visual function before surgery, 7 days, and 21 days post-surgery.

**Result:** The average cost of Phacoemulsification technique was Rp 10,821,038 and the average cost of SICS technique was Rp 10,443,544. QALYs at day7 post-surgery of Phacoemulsification and SICS was 9.49 and 8.95, respectively. While QALYs at day21 post- surgery of Phacoemulsification and SICS was 10.37 and 10.15, respectively. ICER values for Phacoemulsification versus SICS at day7 post-surgery was Rp 696,360 (USD 49,74) while at day 21 was Rp 1,723,559 (USD 123,11).

**Conclusion:** Phacoemulsification and SICS are effective ways to improve the quality of life related to visual function. The incremental cost per QALYs obtained via Phacoemulsification from SICS at D7 and day21 post- surgery were less than Indonesia's GDP per capita income of USD 3,347, means that Phacoemulsification is more cost effective than SICS technique for cataract surgery.

**Keywords:** Cataract surgery, Cost-effectiveness, Small incision, Phacoemulsification, Quality of life

### **Introduction**

Cataract is the second most common cause of visual impairment in the world at 33% and causes 51% of blindness in the world (1). Cataract is in the second position of eye disease which becomes a priority in the world. This shows that cataract is still a priority problem for eye diseases which must be addressed. Around 20 million people suffer from blindness caused by cataracts, 90% of which are found in the developing countries, including Indonesia (1,2).

The rate of blindness caused by cataracts in Indonesia is the highest in Southeast Asia and is ranked the third in the world at 1.47% (3). In Indonesia, it is estimated that in every minute, one person becomes blind. This number will be doubled by 2020

in relation to increasing life expectancy (4,5). Visual impairments due to cataracts

have negative impacts on mobility, participation in social activities, work productivity, leisure activity, reduced ability to conduct daily activities to become dependent, and may cause depression (5).

The treatment for cataracts is only by surgery which can be expensive (6). There are several techniques for performing cataract surgery, each with different resource utilization and cost. In view of the limited budget especially in developing countries, there is a need to perform an economic evaluation to decide on which intervention to select. Cost-Effectiveness Analysis (CEA) is an economic evaluation tool that compares the health benefits and measures the cost of each intervention with the same goal to determine which intervention would be more cost-effective (7, 8).

As for the methods of cataract surgery at Undaan Eye Hospital Surabaya, there are small incision methods (SICS) and Phacoemulsification. SICS is a conventional technique which does not depend on machines, does not require expensive equipment investment, and the transfer of

skills to novice operators may also be conducted well. Therefore, the SICS technique has been considered as a safe and effective technique for cataract surgery especially in the developing countries (9). Phacoemulsification has been the method of choice for cataract extraction in the developed countries over the past few years. Phacoemulsification is a minimal suture cataract surgery technique which uses ultrasonic vibrations to destroy the lens nucleus. Phacoemulsification is much more dependent on technology than other surgical techniques.

Boughton (2009) stated that in relation to the cost of treatment incurred using the Phacoemulsification technique, policy analysts had questioned the feasibility of utilizing it in the low and middle-income countries. Phacoemulsification is preferred in developed countries with a large health budget but not for developing countries due to financial constraints (10). However, it is necessary to do something to make health services more effective, efficient, and economical as well as to allocate resources such as conducting economic evaluations related to the available treatment alternatives through a cost-effectiveness analysis (11). Therefore, in order to know whether Phacoemulsification can be more cost-effective compared to SICS, we need to perform CEA.

### **Method**

This was a prospective study following up patients from before surgery up to 21 days post surgery. The patients had their cataract procedure at the Undaan Eye Hospital Surabaya. The inclusion criteria were all cataract patients with mature cataracts, without complications of glaucoma, retinal detachment, and traumatic cataracts. All patients who had undergone the cataract procedure via Phacoemulsification and SICS between January 2019 -March 2019 were recruited. A total of 155 patients with 25 patients and 130 patients had SICS and the Phacoemulsification technique, respectively.

The cost of both techniques being compared was from the patient's perspective. The costs consisted of direct costs such as payment made by patients for hospital bills and indirect costs such as costs due to lost productivity, transportation costs, and expenditure for companions. Lost productivity costs were measured by calculating work time lost (in hours or days), then multiplied with income (per hours or days) for salaried patients, or the number of products which were not successfully produced or sold multiplied by the product unit price for self-earning patients. Hospital billings imposed on patients had been obtained from the hospital record while the indirect costs were obtained through interviews with patients.

Quality-Adjusted Life Years (QALYs) was used as the outcome measure, with the formula  $QALYs = Utility \times Years\ of\ Benefit$ . QALYs measure health as a combination of the Years of Benefit and the quality of life (QoL). The 'Visual Function 25' questionnaire (VF-25) which is QoL questionnaire regarding visual function was used to assess the effectiveness of cataract surgery which was applied before surgery, at 7 days, and 21 days' post surgery. The VF-25 questionnaire was developed by the National Eye Institute Visual Function and has been used in a variety of large population-based eye surveys which have been validated into several languages (12). NEI VFQ has good multidimensional, reliability, and validity content and can be completed in the shortest possible time (12–15).

The cost-effectiveness analysis applied in this study was to show how much the cost per QALYs gained via phacoemulsification is compared to SICS. The formula used in this study was the incremental cost effectiveness ratio between cataract surgery via Phacoemulsification versus SICS:

$$ICER = \frac{Cost_{Phacoemulsification} - Cost_{SICS}}{QALY_{Phacoemulsification} - QALY_{SICS}}$$

### Ethics Statement

Ethics approval (ref number: 1265-KEPK) was obtained from the Health Research Ethics Committee, Faculty of Nursing, Universitas Airlangga.

### Results

#### Characteristics of Respondents

The characteristics of respondents in this study is as shown in Table 1. Age categorization in this study was conducted based on age classification according to the Indonesian Ministry of Health in 2009 which are 36-45 years (final adults), > 45-55 years (early elderly), > 55-65 years (final elderly), and > 65 years (elderly) (16). The characteristics of family income in this study are based on the Governor's Decree of East Java Number 188/665/KPTS/013/2018 regarding Regency/City Minimum Wages in East Java 2019 (17). The categorization of education levels is based on the Indonesian Ministry of Education (2003) which is low education (no school-graduating junior high school) and higher education (> graduating high school) (18).

**Table 1:** Distribution Frequency Characteristics of Respondents

Characteristics of respondent	Surgery technique			
	SICS (n=25)		Phacoemulsification (n=130)	
	Total n	%	Total n	%
Age (years)				
36-45	1	4,00	6	4,61
>45-55	6	25,00	37	28,46
>55-65	9	36,00	44	33,85
>65	9	36,00	43	33,08
Sex				
Male	12	48,00	65	50,00
Female	13	52,00	65	50,00
Work				
Housewives	8	32,00	40	30,76
Farmer	3	12,00	12	9,23



Characteristic respondent	Surgery technique			
	SICS (n=25)		Phacoemulsification (n=130)	
	Total n	Total %	Total n	Total %
Civil servants	0	0,00	9	6,92
Entrepreneur	9	36,00	29	22,31
Traders	1	4,00	7	5,38
Private employees	1	4,00	14	10,76
Retired	1	4,00	8	6,15
Not work	2	8,00	11	8,46
Family income (Rp)				
≤3,871,052	0	0,00	11	8,46
>3,871,052-7,742,104	1	52,00	42	32,31
>7,742,104-11,613,156	3			
>11,613,156	7	28,00	48	36,92
Education				
No school	1	4,00	11	8,46
Graduating elementary school	8	32,00	22	16,92
Graduating junior high school	6	24,00	26	20,00
Graduating high school	8	32,00	49	37,69
Diploma	1	4,00	0	0,00
Bachelor	1	4,00	18	13,84
Post graduate	0	0,00	4	3,08

### Costs of Cataract Surgery

All the costs incurred at pre-surgery, during surgery procedure and at post-surgery were totaled. The minimum direct cost of cataract surgery with the SICS technique was Rp 4,479,000 and the minimum direct cost of cataract surgery with the Phacoemulsification technique was Rp 6,127,000. The maximum direct cost of cataract surgery with the SICS technique was Rp 12,039,000 and the maximum direct cost of cataract surgery with the Phacoemulsification technique was Rp

18,237,000. The average direct cost of cataract surgery with the SICS technique and Phacoemulsification technique was Rp 9,332,000 and Rp 9,479,319, respectively (Table 2).

**Table 2:** Distribution Frequency of Direct Costs Cataract Surgery

	Phacoemulsification	SICS
Minimum Direct Cost (Rp)	6,127,000	4,479,000
Maximum Direct Cost (Rp)	18,237,000	12,039,000
Average Direct Cost (Rp)	9,479,319	9,332,000

The minimum indirect cost of cataract surgery with the SICS technique was Rp 26,742 while by Phacoemulsification technique was Rp 33,034. The maximum indirect cost with the SICS technique is Rp 4,333,330 and by Phacoemulsification technique is Rp 16,264,666. The average indirect cost of cataract surgery with SICS technique and Phacoemulsification was Rp 1,111,544 and Rp 1,341,719, respectively (Table 3). The overall average patient's cost of cataract surgery with the SICS technique and Phacoemulsification was Rp 10,443,544 and Rp 10,821,038, respectively.

**Table 3:** Distribution Frequency of Indirect Costs Cataract Surgery

	Phacoemulsification	SICS
Minimum Indirect Cost (Rp)	33,034	26,742
Maximum Indirect Cost (Rp)	16,264,666	4,333,330
Average Indirect Cost (Rp)	1,341,719	1,111,544

Thus, the incremental cost of Phacoemulsification from SICS techniques was Rp 377,494, (range between Rp 751,659 and Rp 12,468,336 (Table 4).

**Table 4:** Incremental Cost Effectiveness Ratio (ICER)

	Phacoemulsification	SICS	Incremental (Phacoemulsification-SICS)
Minimum Cost (Rp)	6,432,326	5,680,667	751,659
Maximum Cost (Rp)	27,423,666	14,955,330	12,468,336
Average Cost (Rp)	10,821,038	10,443,544	377,494
QALY Day 7 post-surgery	9,49	8,95	0.54
QALY Day 21 post-surgery	10,37	10,15	0.22

ICER D+7 =  $(10,821,038 - 10,443) / (9.49 - 8.95) =$   
Rp 696,360 (USD 49,74)

ICER D+21 =  $(10,821,038 - 10,443) / (10.37 - 10.15) =$   
Rp 1,723,559 (USD 123,11)

### Outcome Measurement

The average QALYs of cataract surgery patients with the Phacoemulsification technique was higher than the QALYs for

SICS technique at Day 7 post-surgery. Similarly, the average QALYs at Day 21 post-surgery was higher via the Phacoemulsification technique compared to the SICS technique although the difference was not much (see Table 4).

### Incremental Cost Effective Ratio (ICER)

The incremental cost of cataract surgery via Phacoemulsification compared to SICS was Rp 377,494 (range between Rp 751,659 and Rp 12,468,336). The incremental QALYs at Day 7 and Day 21 post-surgery were 0.54 and 0.22, respectively (see Table 4).

The ICER between Phacoemulsification and SICS at Day 7 post-surgery was Rp 696,360 (USD 49,74), while ICER at Day 21 post-surgery was Rp 1,723,559 (USD 123,11). The Indonesia per capita GDP of the same year of study (2015) was USD 3,347 (22).

### Discussion

In this study, the financial implications of having cataract surgery from the patient's perspective had been determined. In addition to cost, the QALYs comparison had been made between cataract surgeries via the high technology Phacoemulsification technique and the conventional SICS technique.

Both the average direct and indirect costs of cataract surgery by the Phacoemulsification technique was more expensive than by SICS. QALYs were also higher among cataract surgery patients who went for the Phacoemulsification technique compared to SICS at Day 7 post-surgery. This could be due to the more surgical incisions made on the cornea of the eye when applying the conventional SICS technique compared to the use of high technology equipment by the Phacoemulsification technique which only involves small incisions. At Day 7 post-surgery, the healing process took longer and the patient suffered from a pain condition longer via SICS compared to the Phacoemulsification technique. The incremental QALYs at Day 21 post-surgery were small since by then patients who had undergone both techniques would have recovered.

In this study the ICER of cataract surgery by Phacoemulsification from SICS technique was Rp 696,360 (USD 49,74) at Day 7 post surgery and Rp1,723,559 (USD 123,11) at Day 21 post-surgery. WHO had defined that for an intervention to be considered as cost-effective, ICER should be compared with the

country's gross domestic product (GDP) percapita income (very cost-effective if ICER< GDP percapita; cost-effective if ICER equals to 1-3 times GDP per capita; not cost-effective if ICER > 3 times GDP per capita) (19–21). According to the World Bank Data in the year of study (2015), Indonesia's GDP per capita income was USD 3,347 (22). Thus, since the ICER value was less than one Indonesia GDP per capita income, cataract surgery by Phacoemulsification was a more cost effective technique than the SICS technique. (19–21). This study should have considered cost from the hospital or provider's perspective so that a true cost-effective technique of cataract surgery could be determined. Nevertheless, doctors and patients could be encouraged to use the Phacoemulsification technique since it provides better QALYs and is cost-effective.

### **Conclusion**

Phacoemulsification and SICS are effective ways to improve QALY related to visual function. However, compared to SICS, Phacoemulsification is a cost effective technique for cataract surgery.

### **Conflict of interest**

The authors declare that they have no conflict of interest.

### **Acknowledgments**

This work was supported by the Eye Hospital Undaan Eye Hospital Surabaya.

### **Author Contributions**

Conceptualization: AW, E, RDW, TNR. Data curation: AW, E, RDW, TNR. Formal analysis: AW, E, RDW, TNR. Funding acquisition: None. Methodology: AW, E, RDW, TNR. Project administration: AW. Visualization: AW, MD, E, RDW, TNR. Writing – original draft: AW, MD, E, RDW, TNR. Writing – review & editing: AW, MD, E, RDW, TNR

### **ORCID**

Anggun Wulandari <https://orcid.org/0000-0003-3947-9269>

Maznah Dahlui <https://orcid.org/0000-0003-4923-9410>

Ernawaty <https://orcid.org/0000-0001-9786-2456>

Ratna Dwi Wulandari <https://orcid.org/0000-0003-4365-5747>

Thinni Nurul Rochmah <https://orcid.org/0000-0001-8845-1153>

### **References**

1. World Health Organization. Priority eye disease. Geneva: World Health Organization; 2014. Available from: <http://www.who.int/blindness/causes/priority/en/index1.html>.
2. Tana L, Mihardja L & Lutfah R. Smoking and age as a risk factor for cataracts in workers aged ≥30 years in agriculture. *Univers Med J*. 2007;26(3):111–59.
3. Tamansa GE, Saerang JSM & Rares LM. Prediction of oil fuel consumption for road vehicles until 2040 using leap software. *Clin Med J*. 2016;1(1):64–9.
4. Soehardjo. Cataract blindness: risk factors, clinical management and control. Yogyakarta: Gadjah Mada University; 2004.
5. Saw S-M, R H, Gazzard GM, Koh D, Widjaja D & Tan DTH. Causes of low vision and blindness in rural Indonesia. *Br J Ophthalmol*. 2003;87(1):1075–1078.
6. Zorab AR, Straus H & Dondrea LC. Lens and cataract. San Fransisco: American Academy of Ophthalmology; 2006.
7. Sanchez L. Pharmacotherapy: a pathophysiologic approach. United States of America: McGraw-Hill Companies Inc; 2008.
8. Shepard DS & Thompson MS. First principles of cost-effectiveness analysis in health. *Public Heal Rep*. 1979;94(6):535–43.
9. Venkatesh R, Das M, Prashanth S & Muralikrishnan R. Manual small incision cataract surgery in eyes with white cataracts. *Indian J Ophthalmol*. 2005;53(3):173–6.
10. Boughton B. Phaco and ECCE. 2009 [cited 2018 Nov 1]. Available from: <https://www.aao.org/eyenet/article/phaco-ecce>.

11. Rangkuti SN. The effect of counseling on costs, outcomes, and the level of adherence to the therapy of dyslipidemic patients in An-Nisa Hospital Tangerang. Medan: University of North Sumatra; 2017.
12. Mangione C, Berry S & Spritzer K. Identifying the content area for the 51-item national eye institute visual function questionnaire: results from focus groups with visually impaired persons. *Arch Ophthalmol*. 1998;116(1):227–33.
13. Cassard S, Patrick D & Damiano A. Reproducibility and responsiveness of the VF-14: an index of visual functional impairment in patients with cataracts. *Arch Ophthalmol*. 1995;113(1):1508–13.
14. Espallargues M & Alonso J. Effectiveness of cataract surgery in Barcelona, Spain site results of an international study. *J Clin Epidemiol*. 1998;51(10):843–852.
15. Steinberg E, Tielsch J & Schein O. The VF-14: an index of visual functional impairment in patients with cataract. *Arch Ophthalmol*. 1994;2(1):630–638.
16. Ministry of Health of the Republic of Indonesia. Indonesian health profile. Jakarta: Ministry of Republic of Indonesia; 2009.
17. Governor of East Java. Decree of the Governor of East Java number 188/665/KPTS/013/2018 concerning regency/city minimum wages in East Java in 2019. East Java: Governor of East Java; 2019.
18. Ministry of National Education of the Republic of Indonesia. Law of the Republic of Indonesia no. 20 about the national education system. Indonesia: Ministry of National Education of the Republic of Indonesia; 2003.
19. Gandola AE, Dainelli L, Zimmermann D, Dahlui M & Detzel P. Milk powder fortified with potassium and phytosterols to decrease the risk of cardiovascular events among the adult population in Malaysia : a cost-effectiveness analysis. *Nutrients*. 2019;11(1235):1–19.
20. Baltussen R, Sylla M & Mariotti SP. Cost-effectiveness analysis of cataract surgery : a global and regional analysis. *Bull World Heal Organ*. 2004;82(5):338–46.
21. Ma Y, Huang J, Zhu B, Sun Q, Miao Y & Zou H. Cost-utility analyses of cataract surgery in advanced age-related macular degeneration. *Optom Vis Sci*. 2016;93(2):165–72.
22. Dwiprahasto I, Kristin E, Endarti D, Pinzon RT, Yasmina A, Thobari JA, et al. Cost effectiveness analysis of rivaroxaban compared to warfarin and aspirin for Stroke Prevention Atrial Fibrillation (SPAF) in the Indonesian healthcare setting. *Indones J Pharm*. 2019;30(1):74–84.
23. Nasri MFA & Utomo TS. Prediction of oil fuel consumption for road vehicles until 2040 using leap software. *J Mech Eng*. 2015;3(2):198–207.