**Annex 1**

Prisma 2020 Checklist

| **Section and Topic**  | **Item #** | **Checklist item**  | **Location where item is reported**  |
| --- | --- | --- | --- |
| **TITLE**  |  |
| Title  | 1 | Identify the report as a systematic review. | Pages 1 and 2 |
| **ABSTRACT**  |  |
| Abstract  | 2 | See the PRISMA 2020 for Abstracts checklist. | Page 2 |
| **INTRODUCTION**  |  |
| Rationale  | 3 | Describe the rationale for the review in the context of existing knowledge. | Pages 2 and 3 |
| Objectives  | 4 | Provide an explicit statement of the objective(s) or question(s) the review addresses. | Page 3 |
| **METHODS**  |  |
| Eligibility criteria  | 5 | Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. | Page 4 and Annex 3 |
| Information sources  | 6 | Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted. | Page 4 |
| Search strategy | 7 | Present the full search strategies for all databases, registers and websites, including any filters and limits used. | Table 2 |
| Selection process | 8 | Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process. | Page 4 |
| Data collection process  | 9 | Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process. | Page 4 |
| Data items  | 10a | List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect. | Page 4 |
| 10b | List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information. | N/A |
| Study risk of bias assessment | 11 | Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process. | Pages 4 and 8 |
| Effect measures  | 12 | Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results. | N/A |
| Synthesis methods | 13a | Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)). | Page 4 |
| 13b | Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions. | N/A |
| 13c | Describe any methods used to tabulate or visually display results of individual studies and syntheses. | Page 4 |
| 13d | Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used. | N/A |
| 13e | Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression). | N/A |
| 13f | Describe any sensitivity analyses conducted to assess robustness of the synthesized results. | N/A |
| Reporting bias assessment | 14 | Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases). | Page 8 |
| Certainty assessment | 15 | Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. | Page 4 |
| **RESULTS**  |  |
| Study selection  | 16a | Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram. | Figure 1 |
| 16b | Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded. |  |
| Study characteristics  | 17 | Cite each included study and present its characteristics. | Table 4 |
| Risk of bias in studies  | 18 | Present assessments of risk of bias for each included study. |  |
| Results of individual studies  | 19 | For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots. |  |
| Results of syntheses | 20a | For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies. | Page 5 |
| 20b | Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect. | N/A |
| 20c | Present results of all investigations of possible causes of heterogeneity among study results. | N/A |
| 20d | Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results. | N/A |
| Reporting biases | 21 | Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed. | Page 8 |
| Certainty of evidence  | 22 | Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed. | Page 5 |
| **DISCUSSION**  |  |
| Discussion  | 23a | Provide a general interpretation of the results in the context of other evidence. | Pages 7 and 9 |
| 23b | Discuss any limitations of the evidence included in the review. | Page 8 |
| 23c | Discuss any limitations of the review processes used. | Page 8 |
| 23d | Discuss implications of the results for practice, policy, and future research. | Pages 7 and 8 |
| **OTHER INFORMATION** |  |
| Registration and protocol | 24a | Provide registration information for the review, including register name and registration number, or state that the review was not registered. | Page 3 |
| 24b | Indicate where the review protocol can be accessed, or state that a protocol was not prepared. | Page 3 |
| 24c | Describe and explain any amendments to information provided at registration or in the protocol. | N/A |
| Support | 25 | Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review. | Page 9 |
| Competing interests | 26 | Declare any competing interests of review authors. | Page 9 |
| Availability of data, code and other materials | 27 | Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review. |  |

*From:*  Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

**Annex 2**

List of low- and middle-income countries

LIC

Afghanistan, Burkina Faso, Burundi, Central African Republic, Chad, Congo, Dem. Rep, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Korea, Dem. People's Rep, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Somalia, South Sudan, Sudan, ﻿Syrian Arab Republic, Togo, Uganda, Yemen, Rep., Zambia.

Lower MIC

Angola, Algeria, Bangladesh, Benin, Bhutan, Bolivia, Cabo Verde, Cambodia, Cameroon, Comoros, Congo, Rep., Côte d'Ivoire, Djibouti, Egypt, Arab Rep., El Salvador, Eswatini, Ghana, Haiti, Honduras, India, Indonesia, Iran, Islamic Rep., Kenya, Kiribati, Kyrgyz Republic, Lao PDR, Lebanon, Lesotho, Mauritania, Micronesia, Fed. States, Mongolia, Morocco, Myanmar, Nepal, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Samoa, São Tomé and Principe, Senegal, Solomon Islands, Sri Lanka, Tanzania, Tajikistan, Timor-Leste, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Zimbabwe.

Higher MIC

Albania, American Samoa, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Equatorial Guinea, Ecuador, Fiji, Gabon, Georgia, Grenada, Guatemala, Guyana, Iraq, Jamaica, Jordan, Kazakhstan, Kosovo, Libya, Malaysia, Maldives, Marshall Islands, Mauritius, Mexico, Moldova, Montenegro, Namibia, North Macedonia, Palau, Paraguay, Peru, Russian Federation, Serbia, South Africa, St. Lucia, St. Vincent and the Grenadines, Suriname, Thailand, Tonga, Türkiye, Turkmenistan, Tuvalu.

**Annex 3**

Inclusion and exclusion criteria, presented using PICOTS framework.

|  |  |  |
| --- | --- | --- |
| **Descriptor** | **Inclusion criteria** | **Exclusion criteria** |
| **P**atient population | Pediatric patients, including newborns and infants, suffering from any congenital heart diseases | Adult patients or studies focusing on pediatric to adult transition |
| **I**ntervention | Not applicable | Not applicable |
| **C**omparison | Not applicable | Not applicable |
| **O**utcome | Access to healthcare for the cardiac condition, be it surgical, interventional, or medical treatment | Articles reporting **only** clinical variables |
| **T**iming | Articles published after 2000 | Articles published before 2000 |
| **S**tudies | Patients living in low- and middle-income countriesQualitative, quantitative or mixed-methods studiesPublished in English, French, Spanish and Portuguese | Patients living in high-income countriesReview articlesLetters to the editor |

**Annex 4**

Search string for each database.

|  |  |
| --- | --- |
| **Database** | **Search strategies** |
| PubMed | (health AND (access OR barrier OR disparities)) AND ((cardiovascular OR heart) AND (defect? OR disease? OR condition?)) AND (child\* OR infant OR p?ediatric) AND (transitional countr\* OR global south OR lmic OR lmics OR lamic OR lamics OR lami countr\* OR third world OR developing or less\* developed OR least developed OR under developed OR underdeveloped OR middle income OR low income OR low-middle income OR lower-middle income OR upper-middle income OR Africa\* OR Asia\* OR Latin America\* OR South America\* OR Central America\* OR Middle East\* OR Eastern Mediterranean OR Eastern Europe\* OR Pacific OR Micronesia OR Afghanistan OR Burkina-Faso OR Burundi OR Central-African-Republic OR Chad OR Congo OR Eritrea OR Ethiopia OR Gambia OR Guinea OR Guinea-Bissau OR Korea OR Liberia OR Madagascar OR Malawi OR Mali OR Mozambique OR Niger OR Rwanda OR Sierra-Leone OR Somalia OR South-Sudan OR Sudan OR Syria? OR Togo OR Uganda OR Yemen OR Zambia OR Angola OR Algeria OR Bangladesh OR Benin OR Bhutan OR Bolivia OR Cabo-Verde OR Cambodia OR Cameroon OR Comoros OR Côte-d'Ivoire OR Ivory-Coast OR Djibouti OR Egypt OR El-Salvador OR Eswatini OR Ghana OR Haiti OR Honduras OR India OR Indonesia OR Iran OR Kenya OR Kiribati OR Kyrgyz\* OR Lao OR Lebanon OR Lesotho OR Mauritania OR Micronesia OR Mongolia OR Morocco OR Myanmar OR Nepal OR Nicaragua OR Nigeria OR Pakistan OR Papua-New-Guinea OR Philippines OR Samoa OR São-Tomé-and-Principe OR Senegal OR Solomon-Islands OR Sri Lanka OR Tanzania OR Tajikistan OR Timor-Leste OR Tunisia OR Ukraine OR Uzbekistan OR Vanuatu OR Vietnam OR West-Bank OR Gaza OR Palestine OR Zimbabwe OR Albania OR American-Samoa OR Argentina OR Armenia OR Azerbaijan OR Belarus OR Belize OR Bosnia-and-Herzegovina OR Botswana OR Brazil OR Bulgaria OR China OR Colombia OR Costa-Rica OR Cuba OR Dominica OR Dominican-Republic OR Equatorial-Guinea OR Ecuador OR Fiji OR Gabon OR Georgia OR Grenada OR Guatemala OR Guyana OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kosovo OR Libya OR Malaysia OR Maldives OR Marshall-Islands OR Mauritius OR Mexico OR Moldova OR Montenegro OR Namibia OR North-Macedonia OR Palau OR Paraguay OR Peru OR Russia? OR Serbia OR South Africa OR St. Lucia OR St.-Vincent-and-the-Grenadines OR Suriname OR Thailand OR Tonga OR Türkiye OR Turkey OR Turkmenistan OR Tuvalu) |
| Scopus | (health AND (access OR barrier OR disparities)) AND ((cardiovascular OR heart) AND (defect? OR disease? OR condition?)) AND (child\* OR infant OR p?ediatric) AND ( ( developing AND countr\* ) OR ( lmic ) OR ( low- AND middle-income AND countr\* )) |
| Web of Science | (health AND (access OR barrier OR disparities)) AND ((cardiovascular OR heart) AND (defect? OR disease? OR condition?)) AND (child\* OR infant OR p?ediatric) AND (developing countr\* OR LMIC OR low- and middle-income countries) |

**Annex 5**

Articles included in this systematic review

|  |  |  |  |
| --- | --- | --- | --- |
| **Authors** | **Year** | **Country** | **Approach** |
| Tefuarani N, Hawker R, Vince J, Sleigh A, Williams G. | 2001 | Papua New Guinea | Quantitative |
| Begic H, Tahirovic H, Mesihovic -Dinarevic S, Ferkovic V, Atic N, Latifagic A. | 2003 | Boznia-Herzegovina | Quantitative |
| Khongphatthanayothin A, Layangool T, Sittiwangkul R, Pongprot Y, Lertsapcharoen P, Mokarapong P. | 2005 | Thailand | Quantitative |
| Saxena. 2005. | 2005 | India | Personal experience |
| Kowalsky RH, Newburger JW, Rand WM, Castaneda AR. | 2006 | Guatemala | Quantitative |
| Awori MN, Ogendo SWO, Gitome SW, Ong'uti SK, Obonyo NG. | 2007 | Kenya | Quantitative |
| Kumar RK, Shrivastava S. | 2008 | India | Personal experience |
| Leon-Wyss JR, Veshti A, Veras O, Gaitan GA, O’Connell M, Mack RA, et al. | 2008 | Guatemala | Quantitative |
| Sandoval N, Kreutzer C, Jatene M, Di Sessa T, Novick W, Jacobs JP, Bernier PL, Tchervenkov CI. | 2010 | South America | Quantitative |
| Kiran VS, Nath PP, Maheshwari S. | 2011 | India | Quantitative |
| Ramakrishnan S, Khera R, Jain S, Saxena A, Kailash S, Karthikeyan G, Kothari SS, Juneja R, Bhargava B, Kalaivani M, Mehta M, Bahl VK, Airan B. 2011. | 2011 | India | Mixed methods |
| Sadoh WE, Nwaneri DU, Owobu AC. | 2011 | Nigeria | Quantitative |
| Salgado CL, Lamy ZC, Nina RV, Melo LA, Lamy Filho F, Nina VJ. | 2011 | Brazil | Qualitative |
| Macumbi A. | 2012 | Mozambique | Qualitative |
| Maheshwari S, Animasahun BA, Njokanma OF. | 2012 | India | Quantitative |
| Aliku TO, Lubega S, Lwabi P, Oketcho M, Omagino JO, Mwambu T. | 2014 | Uganda | Quantitative |
| Animasahun BA, Johnson A, Ogunkunle OO, Idowu OA, Bode-Thomas F, Maheshwari S, Omokhodion Si, Njokanma OF. | 2014 | Nigeria | Quantitative |
| Jenkins KJ, Castaneda AR, Cherian KM, Couser CA, Dale EK, Gauvreau K, Hickey PA, Koch Kupiec J et al. | 2014 | Worldwide | Quantitative |
| Nguyen N, Jacobs JP, Dearani JA, Weinstein S, Novick WM, Jacobs ML, Massey J, Pasquali SK et al. | 2014 | Worldwide | Quantitative |
| da Silva Mattos S, Vieira Hazin Sh, Teixeira Regis C, Sousa Soares de Araújo J, Cruz de Lira Albuquerque F, Didier Nunes Moser LR, de Paula Hatem T, Gomes de Freitas CP, Alves Mourato F, et al. | 2015 | Brazil | Quantitative |
| Lapao LV, Correia A. | 2015 | Cape Verde | Mixed methods |
| Phuc VM, Tin DN, Cam Giang DT. | 2015 | Vietnam | Personal experience |
| Raj M, Paul M, Sudhakar A, Varghese AA, Haridas AC, Kabali C, Kumar RK. | 2015 | India | Quanti |
| Al-Ammouri I, Ayoub F. | 2016 | Jordan | Quanti |
| Castro F, Zuniga J, Higuera G, Carrion Donderis M, Gomez B, Motta J. | 2016 | Panama | Quantitative |
| Edwin F, Entsua-Mensah K, Sereboe LA, Tettz MM, Aniteye EA, Tamatey MM, Adzamli I, Akyaa-Yao N, Gyan KB, Ofosu-Appiah E, Kotei D. | 2016 | Ghana | Quantitative |
| Ezzat S, Saeedi O, Saleh DA, Hamzeh H, Hamid MA, Crowell N. | 2016 | Egypt | Mixed methods |
| Okonta KE, Tobin-West C. | 2016 | Nigeria | Quantitative |
| Rashid U, Qureshi AU, Hyder SN, Sadiq M. | 2016 | Pakistan | Quantitative |
| Staveski SL, Parveen VP, Madathil SB, Kools S, Franck LS. | 2016 | India | Quantitative |
| Bastero P, Staveski SL, Zheleva B, Scanlan E, Cabrera AG, Araujo A, Reyes G, Mery CM, Palacios-Macedo A, Brizard CP. | 2017 | Mexico, India, Vietnam, and Jamaica | Qualitative |
| Ekure EN, Bode-Thomas F, Sadoh WE, Orogade AA, Otaigbe BE, Ujunwa F, Sani UM, Asani M, Animasahun AB, Ogunkunle OO. | 2017 | Nigeria | Quantitative |
| Ekure EN, Sadoh WE, Bode-Thomas F, Orogade AA, Animasahun AB, Ogunkunle OO, Babaniyi I, Anah MY, Otaigbe BE, Olowy A, et al. | 2017 | Nigeria | Quantitative |
| Isaac, Negesh V, Bell A, Soto R, Seepersaud M, Myers K, Zahir S. | 2017 | Guyana | Quantitative |
| Hwang IC, Sisavanh M, Billamay S, Phangmanixay S, Oudavong B, Kang J, Kwon BS, Kim GB, Bae EJ, Noh CI, Choi JY. | 2017 | Laos | Quantitative |
| Olega Aliku T, Lubega S, Namuyonga J, Mwambu T, Oketcho M, Omagino JO, Sable C, Lwabi P. | 2017 | Uganda | Personal experience |
| Altamirano-Diaz L, Norozi K, Seabrook JA, Welisch E. | 2018 | Peru | Qualitative |
| Giambeti A, Butera G, Mvondo CMVE, Cirri S, Varrica A, Moussaidi N, Isgro G, Ambassa JC, Tantchou C, Giambeti G, Frigiola A. | 2018 | Cameroon | Personal experience |
| Olarte-Sierra MF, Suarez R, Rubio MA. | 2018 | Colombia | Qualitative |
| Saxena A. | 2018 | India | Personal experience |
| Vivan L, Comitis G, Naidu C, Hunter C, Lawrenson J. | 2018 | South Africa | Qualitative |
| Wallen TJ, Arnaoutakis GJ, Blenden R, Soto R. | 2018 | Worldwide | Quantitative |
| Orubu ESF, Robert FO, Samuel M, Megbule D. | 2019 | Nigeria | Quantitative |
| Palacios-Macedo A, Merz CM, Cabrera AG, Bastero P, Tamariz-Cruz O, Diliz-Nava H, Garcia-Benitez L, et al. | 2019 | Mexico | Personal experience |
| Shidhika FF, Hugo-Hamman CT, Lawrenson JB, Du Toit HJ, Vosloo SM, Brooks A, Pribut HS, Perkins SR, Zühlke LJ. 2019. | 2019 | Namibia | Quantitative |
| Xianf L, Su Z, Liu Y, Huang Y, Zhang X, Li S, Zhang H. | 2019 | China | Quantitative |
| Al‐Ammouri I, Daher A,Tutunji L, Qutishat H, Hijazi A, Al‐Shaikh H, Al Qusous L, Al‐Othman N, Salah S, Alibrahim O. | 2020 | Jordan | Quantitative |
| El Rassi I, Assy J, Arabi M, Majdalani MN, Yunis K, Sharara R, Maroun-Aouad M, Khaddoum R, Siddik-Sayyid S, Foz C, Bulbul Z, Bitar F. | 2020 | Lebanon | Quantitative |
| Choi S, Shin H, Heo J, Gedlu E, Nega B, Moger T, Bezabih A, Park J, Kim WH. | 2021 | Ethiopia | Qualitative |
| Ibbotson JL, Luitel B, Adhikari B, Jagt KR, Bohler E, Riviello R, Ibbotson GC. | 2021 | Nepal | Personal experience |
| Murni IK, Wirawan MT, Patmasari L, Sativa ER, Arafuri N, Nugroho S, Noormanto. | 2021 | Indonesia | Mixed methods |
| Wamala I, Gongwer R, Doherty-Schmeck K, Jorina M, Betzner A, Zheleva B, Gauvreau K, Baird CW, Jenkins K. | 2021 | Worldwide | Quantitative |
| Zhang XE, Geng Z, Shao J, Yao H, Wang L, Li X, Li Q. | 2021 | China | Personal experience |
| Murni IK, Wibowo T, Arafuri N, Oktaria V, Dinarti LK, Panditatwa D, Patmasari L, Noormanto N, Nugroho S. | 2022 | Indonesia | Quantitative |
| Sabatino ME, Dennis RJ, Sandoval-Trujillo P, Valencia S, Moreno-Medina K, Londono D, Garcia-Torres AE, Tulloch D, Herrera-Almario GE, Peck GL, Sandoval N. | 2022 | Colombia | Quantitative |
| Bansal E, Patel K, Lacossade S, Gue B, Acceme K, Robinson O, Kwan GF, Wilentz JR. | 2023 | Haiti | Quantitative |
| Kim S, Seshadrinathan S, Jenkins KJ, Murala JS. | 2023 | India | Qualitative |

**Annex 6**

Specific barriers by geographic region

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Asia** (n=21) | **Africa** (n=17) | **Americas** (n=11) |
| Approachability/ability to perceive | 13 (61.9%) | 11 (64.7%) | 10 (90.9%) |
| Acceptability/ability to seek | 10 (47.6%) | 4 (23.5%) | 7 (63.6%) |
| Availability/ability to reach | 14 (66.7%) | 16 (94.1%) | 9 (81.8%) |
| Affordability/ability to pay | 17 (80.9%) | 16 (94.1%) | 8 (72.7%) |
| Appropriateness/ability to engage | 16 (76.2%) | 11 (64.7%) | 11 (100%) |