

A Review of Maternal and Child Health Status in Canada and Japan – Reinvigorating Maternal and Child Health Handbook

Rijwana Haque¹, Shafi U. Bhuiyan^{1,2}, Rupesh Rudra¹

¹Department of Public Health Sciences, Dalla Lana School of Public Health, University of Toronto, Ontario, Canada, ²The Chang School, Ryerson University, Toronto, Canada

ABSTRACT

Objective: The objective of this study is to identify the challenges in Canadian health-care system that contributes to higher perinatal, infant, and maternal mortality rate (MMR) compared to other Organization for Economic Co-Operation and Development (OECD) countries, especially Japan, and to make a recommendation based on available data. **Materials and Methods:** Systematic literature search was performed through PubMed, Cochrane Library, and University of Toronto online library. Available data on maternal and child health (MCH) were collected from relevant literature, Statistics Canada and OECD database for secondary analysis. **Results:** We identified that, throughout the period from 2006 to 2016, Canada had a higher rate of maternal mortality compared to Japan, especially in 2014, when MMR in Canada (6.0) was almost twice the rate of Japan (3.3). Between 2005 and 2018, there was a gradual decline in infant mortality rate for both countries, but Japan performed well in keeping the infant mortality rate significantly lower than Canada (1.9 for Japan and 4.5 for Canada in 2017). Introduction of MCH Handbook contributed to keeping up the national health indicators high in Japan even before Japan attained a stable economy. However, differences in national registration practice among OECD countries and inconsistencies in data coverage across Canada caused difficulty in making comparisons. **Conclusion:** Nationally standardized process is needed to investigate and document maternal deaths, which will help Canada take concrete actions to make pregnancy safer for women. Effective partnerships among government agencies, health-care institutions, and pregnant women and their families are needed to ensure the best care.

Key words: Maternal mortality, infant mortality, health-care system, Canada, Japan, Organization for Economic Co-Operation and Development

INTRODUCTION

Sustainable development goal (SDG) launched in September 2015 has received the commitment from global health leaders to implement an ambitious agenda of 17 goals over the next 15 years with SDG 3 focused on ensuring healthy lives and promoting well-being for all. SDG 3 aims to establish an equity parameter with universal health coverage and leave no one behind.^[1] The new global strategy for women and children health and its operational framework are aligned with SDGs, which provide an evidence-based roadmap for ending preventable deaths of women and children by 2030.

Canada has been one of the main advocates for the inclusion of maternal and child health (MCH) in the SDG not only as a single target but also as a central focus after the MDG era. Canada's decision to put MCH as a key priority in the SDG reflects the universality aspect of the post-2015 agenda. Developed countries should also take initiative to address their own challenges while supporting developing countries. As a world leader in the global effort to reduce maternal mortality, Canada is directly supporting MCH initiatives in developing countries.^[2] However, Canada also needs to address its own challenges and examine how the country is dealing with its own MCH issues compared to other Organization for Economic Co-operation and Development (OECD) countries.

Address for correspondence:

Dr. Shafi U. Bhuiyan, Division of Clinical Public Health, Dalla Lana School of Public Health, University of Toronto, Ontario, Canada. Phone: (416)-978-7513 E-mail: shafi.bhuiyan@utoronto.ca

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Japan has gained a reputation globally for maintaining highest life expectancy and lowest infant mortality. Accordingly, Japan has the potential to become the global leader with its strong National Health Policy as well as Global Health Initiatives.^[3] Japan is one of the OECD countries with the lowest maternal and infant mortality rates. In 2012, perinatal mortality rates in Japan were 4:1000 which was the lowest in the world.^[4] In Japan, perinatal care has increased significantly in recent decades which resulted in reduced neonatal and maternal mortality. Different explanations have been proposed for the rapid improvements and recent low rates, and other developing countries as well as developed countries are looking at Japan to learn strategies behind their success. Along with many effective health-care programs, the MCH handbook (MCHH) is a major contributory factor to Japan's success. This handbook is an effective communication tool between pregnant women and health-care providers.^[5]

Since 2001, maternal mortality has been on the rise in Canada and infant mortality is also much higher than Japan. Despite having a very reputable health-care system, Canadian health-care policy leaders need to realize that Canada still has a lot to achieve. This review aims to:

- Identify the gap in the Canadian health-care system to address MCH improvement
- Identify the lessons learned from Japan to improve MCH and
- Make recommendations based on available data.

Search strategy and selection criteria

A systematic literature search was conducted using the keywords on databases including:

- The Cochrane Library
- Medline
- PubMed
- University of Toronto online library
- Ryerson University online library.

In addition, websites of Canadian and Japanese Ministries, the OECD, Statistics Canada, World Bank Database, other relevant international organizations, bilateral agencies such as Japan International Cooperation Agency were browsed while searching.

To find evidence of Canada's commitment to promote safe motherhood and improved child health across the globe and to address the challenges to decrease maternal and infant mortality, a rigorous literature search was performed for published and unpublished article from 1990 to 2019. To assess the health-care system and MCH status of Canada and Japan including health policy of both countries, peer-reviewed published articles, conference proceedings, dissertations, and newspaper articles were systematically reviewed by two reviewers individually to include all eligible studies.

All relevant retrieved data were compared and analyzed to address the research objective. MCH data available from OECD statistics on other leading OECD countries were also collected to assess the global trends.

RESULTS

We grouped our findings from eligible studies according to maternal mortality, infant mortality, and impact of health system on MNCH.

Maternal mortality

Tables 1 and 2 show the direct and indirect causes of maternal mortality in Canada excluding Quebec (2003–2011) and Japan (2015). The rate was represented per 100,000 live births.

In Canada [Table 1], major cause of maternal mortality was a disease of the circulatory system (3.1). Postpartum hemorrhage was the second direct cause of death (1.6) followed by hypertension (1.4).^[6] However, indirect obstetric cause resulted in 2.4 maternal deaths per 100,000 deliveries.

In Japan, postpartum hemorrhage was at the top cause of maternal mortality causing 1.1 maternal deaths per 100,000 live births. Condition such as placenta previa and abruptio placenta contributed to 0.3 deaths per 100,000 live births similar to edema, proteinuria, and hypertensive disorder in pregnancy, childbirth, and the puerperium.^[7] While other direct obstetric cause was responsible for 1.1 death, indirect obstetric cause was associated with 0.8 maternal deaths per 100,000 live births in Japan [Table 2].

Table 1: Diagnoses associated with maternal deaths in Canada (excluding Quebec), 2002/03-2010/11

Diagnosis	Maternal mortality rates per 100,000 deliveries
Disease of the circulatory system	3.1
Postpartum hemorrhage	1.6
Ectopic and molar pregnancy/ abortive outcome	0.9
Hypertension complicating pregnancy, childbirth, and the puerperium	1.4
Antepartum hemorrhage, abruptio placentae, and placenta previa	0.6
Major puerperal infection	0.9
Obstetric embolism	1.4
Other indirect cause	2.4

Adopted from The Public Health Agency of Canada. (2011). Canadian Perinatal Surveillance System monitors and reports on key indicators of maternal, fetal, and infant health in Canada. http://publications.gc.ca/collections/collection_2012/aspc-phac/HP10-19-2011-eng.pdf

The line graph [Figure 1] illustrates the comparison of maternal mortality rate (MMR) of Canada and Japan from 2006–2016 over a period of 10 years.^[8] Throughout this period, Canada had a higher rate of maternal mortality compared to Japan, especially in 2008, when MMR in Canada (9.0) was more than twice the rate of Japan (3.8). Moreover, Japan has been successful to keep the MMR persistently low in the past 10 years except in 2009 when it experienced a sharp increase from 3.7 in 2008 to 5.7. No MMR data were available for Canada after 2014.

Table 2: Diagnosis associated with maternal deaths in Japan (2015)

Diagnosis	Maternal mortality Rates per 100,000 live births
Postpartum hemorrhage	1.1
Ectopic pregnancy	-
Edema, proteinuria, and hypertensive disorder in pregnancy, childbirth, and the puerperium	0.3
Placenta praevia and abruptio placentae	0.3
Antepartum hemorrhage not otherwise classified	-
Other direct obstetric cause	1.1
Obstetric embolism	0.6
Indirect obstetric cause of death	0.8

Adopted from Maternal Death Exploratory Committee in Japan. Hasegawa, J., Sekizawa, A., Tanaka, H., Katsuragi, S., Osato, K., Murakoshi, T. (2016). Current status of pregnancy-related maternal mortality in Japan: A report from the maternal death exploratory committee in Japan. *BMJ Open*, 6(3), e010304. doi: 10.1136/bmjopen-2015-010304

In Figure 2, the line chart compares the MMR among seven OECD countries (Canada, Japan, Australia, United Kingdom, the United States of America, Netherlands, and Sweden). The graph illustrates that MMR in Canada was higher than all other OECD countries compared except the states.^[9]

The differences were particularly wide in the year 2008 and 2010 causing 9 and 6.4 maternal death per 100,000 live births, respectively. However, value point for MMR in Canada in the year 2016 is presented as 0, but for MMR 2016, data were not found for Canada.^[6] However, Japan had noticeably lower rate of MMR (3.4) among OECD countries in 2014 following the Netherlands, which had the lowest rate of 2.9. Other OECD countries showed significant fluctuation in their MMR over the given period, though overall MMR was always low compared to Canada.

Infant mortality

Tables 3 and 4 mention the cause of infant mortality in Japan and Canada in the year 2014. Rate was measured as death per 100,000 live births.^[7,8] In both countries, congenital malformation, deformation, and chromosomal abnormalities were seen to be the main causes of infant death. However, the rate was remarkably higher in Canada (105.7) in comparison with Japan (74.8). Disorder related to short gestational period and low birth weight was the second contributory cause of death in Canada (63.8), but it affected the least in case of Japan (5.9) in the same year. It is worthy to mention that sudden infant death syndrome caused significant infant death in Japan (74.4) in 2014, whereas, in Canada, it was associated with 5.7 cases of infant death per 100,000 live births.

Figure 3 shows a comparison of infant mortality rate according to cause that is common to both Japan and Canada in 2014. Congenital malformation and chromosomal

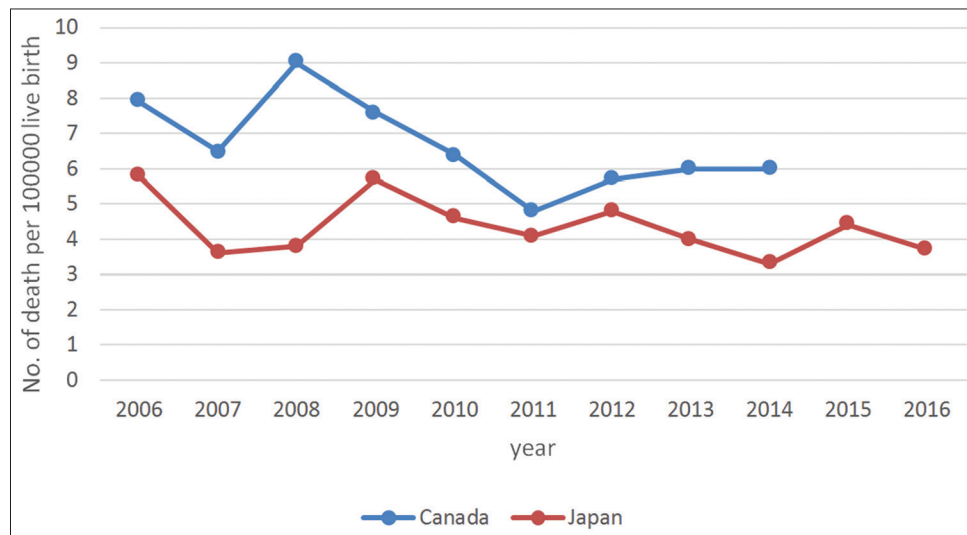


Figure 1: Trend in maternal mortality rate – Canada and Japan (2006–2016)
Source: Statistics Canada (2018), Vital statistics of Japan (2018)

abnormalities were the leading causes of infant death for both countries though the rate was significantly lower in Japan.^[8]

Of the four causes that are common between Japan and Canada, three caused higher infant death in Canada compared to Japan in 2014. The gap was particularly wide in disorders related to short gestation period and low birth weight.

Figure 4 shows a line chart that compares the infant mortality rate per 1000 live births in Japan and Canada between 2008 and 2017. Overall, there was a gradual decline in infant mortality rate for both countries, but Japan performed well in keeping the infant mortality rate well below Canada (1.9 for Japan and 4.5 for Canada in 2017). Since 2008, the trend

in infant mortality rate has been almost the same for Canada (around 5/1000 live births) with only a slight fall in 2017 to reach 4.5 from 5 in 2008.^[9]

The line chart in Figure 5 illustrates the comparison of infant mortality rate in seven OECD countries including Canada and Japan. Between 2006 and 2017, Japan and Sweden had been doing well to keep the infant mortality rates low all through the years. There were sharp rise and fall seen in infant mortality rates (IMR) in countries such as the USA and Australia. For the Netherlands, there was a gradual decline in IMR to reach 3.3 in 2017 from 4.1 in 2007. Although Canada experienced a downward trend in infant mortality rate, it is still higher compared to other OECD countries except for the USA.^[9]

Table 3: Cause of Infant Death and Rate in Canada (2014)

Cause of Infant Death	Infant mortality rate per 100,000 Live births
Congenital malformation, deformation, and chromosomal Abnormalities	105.7
Disorder related to short gestation and low birth weight not elsewhere classified	63.8
Newborn affected by maternal complication of pregnancy	46.3
Newborn affected by the complication of placenta, cord, and membrane	30.7
Newborn affected by other complication of labor and delivery	11.5
Intrauterine hypoxia and birth asphyxia	10.2
Sudden infant death syndrome	5.7

Adopted from Statistics Canada. Table 13 and 10-0395-01
 Leading causes of death, infants Retrieved from: <https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1310039501>

Universal health-care system in Canada and Japan and its effect on MNCH.

Every country has its own way of achieving universal health care. It is a complicated process, which is affected by a wide range of factors including country’s own institutional development, war, epidemic, change in public policy, or any unpredictable event, which can affect the economy of the country. In Canada, publicly financed health-care system bears 69.8% of total health expenditure.^[10] Despite 70% coverage; Canada’s public funding for health is significantly less than most of the OECD countries.^[9]

Moreover, two-third of the Canadians hold private health insurance which is a third-party coverage for services such as prescription drugs, dental care, optical care, rehabilitation services, private rooms, and long-term home care as those services are excluded from reimbursement through public funding. Private insurance benefits in Canada rank second to the USA in respect of per capita spending for private health insurance plan among all OECD countries. In many aspects, this public-private funding in health-care system in Canada is very similar to the health plan currently available

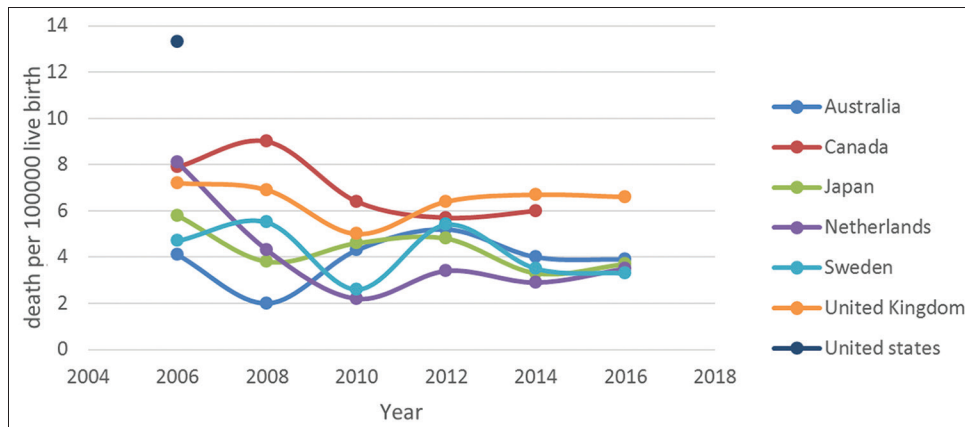


Figure 2: Trend in maternal mortality rate in Organization for Economic Co-Operation and Development (OECD) Countries (2006–2016). No data was available for maternal mortality rate in Canada in 2016
 Source: OECD Health Statistics (2018)

in other countries such as Germany and France, but none of those countries define their health plan as single payer system while Canada does.^[11] Canada does not have one single unified health-care system across the whole country. Each province is responsible for their own system of managing, organizing, and delivering health services and supervising the service providers.^[10]

In Canada, maternal health care was primarily provided by midwives and was limited to houses. In 1972, when universal health-care system was introduced in Canada, maternal health also was covered and physicians instead of midwives used to conduct deliveries. The scarcity of physicians affected timely access to care for mothers, and in some areas such as

northern territories and among the indigenous population, the sufferings are the worst. In recent years, the number of family doctors who are the first point of care in the communities in Canada and a number of hospitals providing maternal care have greatly declined.^[12] Postpartum care except in medically complicated cases are not funded by any government insurance and provided by private institutions and are only accessible to a limited group of the population who can afford a Doula or Nanny for about \$25/h.^[12]

In a maternity experience survey, it was reported that 13% of mothers in Canada found it difficult accessing health care for their infants.^[13] The study shows that Canada’s infant mortality is much higher among the indigenous population. Lack of care and disease prevention causes more hospitalization in the first nation and indigenous infants indicating unmet needs among those communities.^[14]

Japan has gained success in establishing a sustainable universal health-care system and has been maintaining it for over 50 years. After the end of the World War II, Japan was left with severe political and economic crises which had a huge impact on health sector. The long-lasting political and economic unrest severely damaged the insurance funds and health sector infrastructure. To recover from that situation, Japan has not undertaken any significant structural changes. The country decided to rebuild the insurance institutions that it had before the war.^[15]

Since Japan started having economic stability, insurance coverage steadily grew which led Japan closer to health coverage universality. With the cooperation of the Ministry of Health and Welfare (MHW) and Japanese Medical Association, government established a strong affiliation between insurance schemes and thus proceeded to health

Table 4: Cause of infant death and rate in Japan (2014)

Cause of infant death	Infant mortality rate per 100,000 live births
Congenital malformation, deformation, and chromosomal abnormalities	74.8
Certain condition originating in perinatal period	51.1
All other diseases	33.6
Congenital malformation of the heart	21.2
Sudden infant death syndrome	14.4
Birth asphyxia	7.6
Disorder related to the length of gestation and fetal growth	5.9

Adopted from Vital Statistics of Japan (2015). General Mortality Data. Retrieved from: <https://www.mhlw.go.jp/english/database/db-hw/vs01.html>

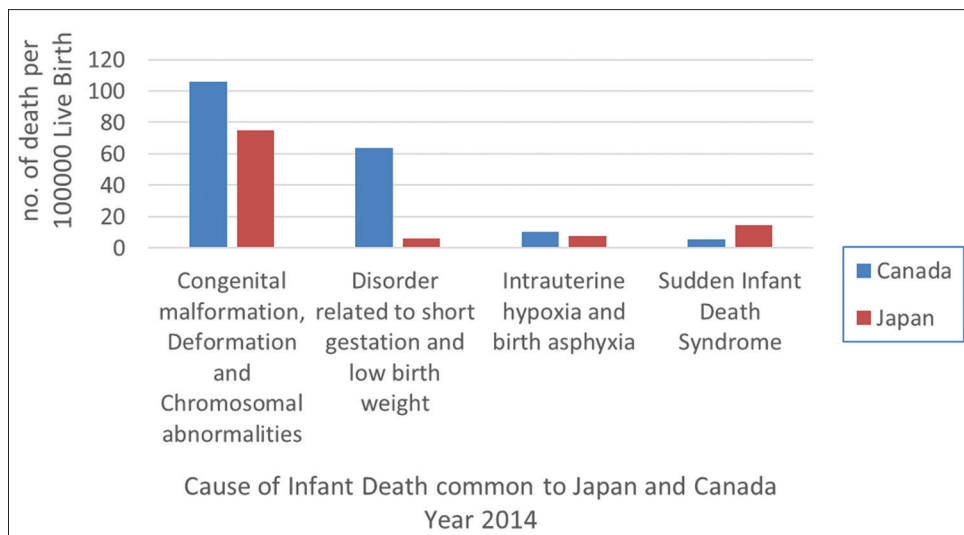


Figure 3: Comparison of the cause of infant mortality common to Canada and Japan (2014)
Source: Statistics Canada (2019). Leading causes of death, infants

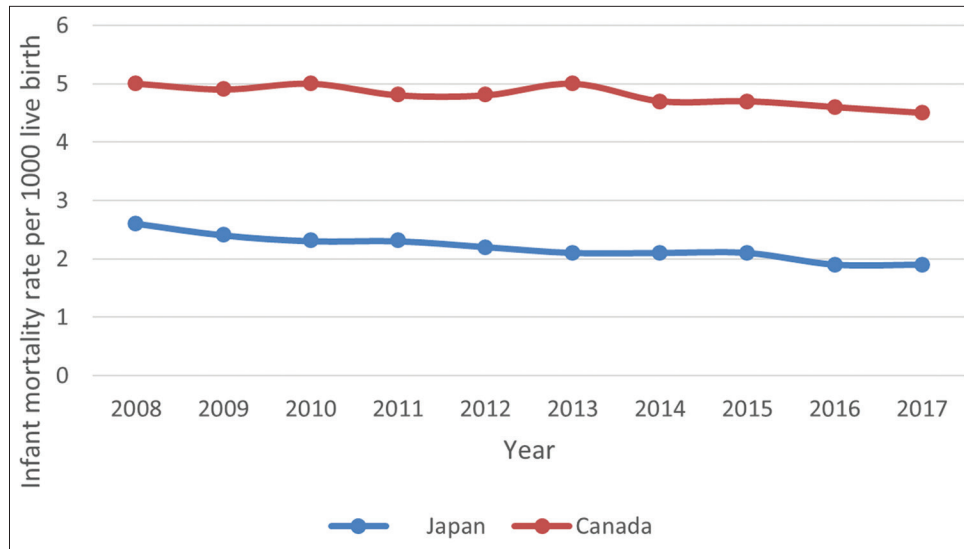


Figure 4: Trend in infant mortality – Canada and Japan (2008–2017)
Source: Statistics Canada (2018), Vital statistics of Japan (2018)

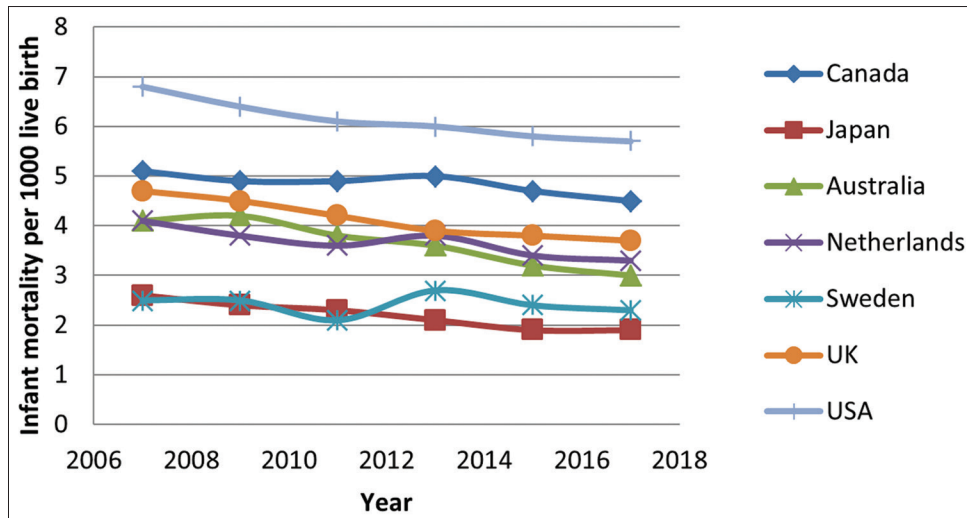


Figure 5: Trend in infant mortality in Organization for Economic Co-Operation and Development (OECD) Countries (2006–2018)
Source: OECD Health Statistics (2018)

equality to ensure “Health for All” by the end of 1950. As the system became more structured and effective, further focus was on the quality of care, cost control, and copayment adjustment.^[16] After the World War II, Japan’s health indicators were improving rapidly. Through implementation of some effective child survival intervention and development of community-based care maternal, newborn and child health improved significantly e.g., reduction in infant mortality from 30 deaths per 1000 live births in 1960 to 7 in 1980 and 3 in 2000.^[17,18]

Over the past 50 years, Japan continued to emerge toward health equity with a rapidly developing equitable system of universal health coverage and set an example in achieving some of the world’s best health outcomes including the

world’s highest life expectancy and one of the world’s best MCH care systems.^[3]

DISCUSSION

In this comparative study of maternal and infant mortality in Canada and Japan, we identified that, in recent years, both maternal and infant mortality rates have been higher in Canada than Japan. Among OECD countries, Canada’s rank dropped down to 19th in 2011 which was second in the 1990s.^[9] There are many reasons for this higher rate of deaths. Apart from the direct and indirect medical causes, many other factors create disparities between countries when compared. Canada is a country of a diverse group of population. Among the

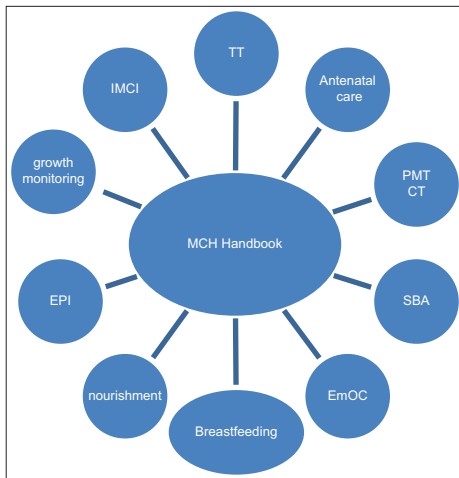


Figure 6: Components of maternal and child health handbook

indigenous population, many modifiable risk factors such as high pre-pregnancy basal metabolic index (BMI), smoking, higher mental stress, illiteracy, and low socioeconomic condition contribute to the high maternal and infant mortality rates.^[16] Inuit mothers have a limited access to maternity care including all health-care services. 9% of Inuit teenagers are parents, whereas 1.3% of other Canadian teenagers are parents. Young mothers are less likely to breastfeed and are more likely to smoke and drink alcohol.^[8] With in-depth research, it is important to identify how those factors affecting Canada's total maternal and infant mortality rates. There is an urgent need for more effective interventions to improve maternal and infant health in Inuit-inhabited areas.^[19]

In 2010, when Canada became the chair of the G8 36th annual summit, MNCH was the summit priority, and after 6 months, the Muskoka initiative on MNCH was established which is considered as an achievement of the G8 summit.^[20] At the summit, Canada's advocacy for the advancement of MCH influenced other G8 countries to focus and contribute for MNCH. Moreover, this initiative has been able to collect \$7.3 million for the improvement MNCH. Since then, Canada has acted as a global leader to aid MNCH and continued to work to improve maternal health and reduce infant mortality.^[2] Moreover, by setting MNCH as a priority of its foreign policy, Canada gained continuous support from other G8 countries for the post-2015 agenda.^[21]

Japan is one of the OECD countries having a very homogenous population and with one of the lowest MMRs. During the past two decades, Japan has been able to lower maternal mortality by half.^[22] Post-World War II Japan had a focus on women-centered care to ensure safe delivery for every woman. Hospitals, clinics, and birth centers have been equipped with trained midwives, nurses, and physicians.^[23] In Japan, pregnant women are provided with 14 antenatal checkups. During these meetings, mothers can discuss the options of safe delivery and other cares available for the

postpartum period.^[24] Japan has been able to ensure almost all deliveries in medical institutions and most of them (98%) are supervised by doctors.^[22] Moreover, the rate of cesarean section (10–20%) depending on the institution is much lower than in North America and also postpartum hospital stay in Japan is much longer (3/4 days) than in North America.^[25] Studies found that along with physicians, midwives have contributed to keep MMRs low in Japan by taking care of low-risk pregnancies, ensuring safe deliveries and also taking care of infants.^[24]

Japan has also been able to keep its infant mortality rate low along with decreased MMRs.^[26] Narrow socioeconomic gap, universal health coverage, frequent antenatal checkups, and the MCHH have been identified as contributing factors of Japan's excellent performance to maintain infant mortality rate low.^[27] However, decreased mortality rate of extremely low and low birth weight babies has also been the reason of overall decreased infant mortality rate.^[28] Many studies shown that the Boshi Kenko Techo (Maternal-child Health Handbook) is a great influencing factor to keep the rates low.^[29] Japan government also provides subsidies to mothers in need to help with obstetric and pediatric complications.

In spite of having very efficient medical care setup, Canada still lags behind in terms of infant mortality than other OECD countries. Canada held the 5th position of OECD ranking in 1991, but unfortunately, it went down to 27 in 2011.^[9] One of the main reasons of infant mortality is preterm birth, and this is mainly caused by older maternal age and increased use of fertility treatment.^[30] The mortality and morbidity of very low birth weight baby are significantly higher in Canada than Japan. The number of newborns with gestational age more than 31 weeks is higher in Japan than that of Canada. Though the survival rate of newborns with lower gestational age is higher in Canada, a report by CBC news stated higher infant mortality among aboriginal infants.^[31] However, Canada has higher reporting and registration rate of infant mortality, which includes preterm birth <24 weeks of gestational age than other comparing countries which could be one of the reasons of Canada's high rate.^[32]

MCHH – A miracle born in Japan and Enlightening the World

MCHH is an effective communication tool between mothers and health-care professionals. Back in 1948, the Ministry of Health and Welfare, Japan, handed out *Boshi Techo* (handbook of mother and children) for the first time.^[33] Since then, it has been updated and enriched with resources many times and has been facilitating maternal health from pregnancy to delivery and postpartum period as well. In one section, it contains all relevant medical information of the mother including body weight, blood pressure, and urinary sugar. Moreover, it has a vital role in influencing child health as it contains all information about antenatal care, immunization history, and

milestone of development from the age 0 to 6 [Figure 6].^[34] MCHH is an educational tool too. It has information about parenting and about early child care which helps parents to make informed decisions to promote child development.^[5]

MCHH educates parents about the developmental delay and makes them aware of early signs of any abnormality, so that they can connect with the health-care providers to take necessary steps for appropriate treatment.^[35] MCHH helps health-care providers to keep track of the medical records of the expecting mother which makes referral very easy in case of emergency or when they need to involve any specialist to manage any complication.

Since 1991, with the vision of decentralization, MCHH is distributed to all municipalities, town, and villages in Japan, and now, almost every parent in Japan uses MCHH. Research shows that, among five most important factors that maintain low infant mortality in Japan, the use of MCHH is the third.^[33] Furthermore, MCHH contributed to keeping up the national health indicators high even before Japan attained a stable economy.^[4]

Limitation

Maternal and infant mortality rates across Canada are not uniform, and data collection and reporting of those data are significantly different for different provinces and territories. On the other hand, Japan has a very homogenous population and has uniform data for the whole country. Future research is needed to identify data discrepancies across Canada.

This study does not present data for provincial and subpopulation due to jurisdictional ownership of data and privacy restrictions from institutions. Another limitation of the study is that very few critique articles were found on the health-care system of Japan and unpublished articles were not accessible.

CONCLUSION

Canada and Japan can learn from each other's achievement and weaknesses and adopt evidence-based strategies, for example, the MCHH in Japan to strengthen their health policies. In Canada, national standardized process is needed to investigate and document maternal deaths, which will help Canada take concrete actions to make pregnancy safer for women. Effective partnerships among government agencies, health-care institutions, professional societies and leaders, health-care professionals, and pregnant women and their families are needed to ensure the best care possible for every pregnant woman and her child in rural and urban communities across Canada including the indigenous population. Improved health-care policies are needed to make health care accessible to all mothers as well as to all patients to ensure sustainable health-care system in Canada.

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