

# Influence of cultural practices on breast cancer risks, stage at presentation and outcome in a multi-ethnic developing country (Review)

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**Abstract.** Malaysia is a developing country made up of three main ethnicities: Malay, Chinese and Indian. There are significant ethnic differences with regard to the type of daily food and cooking methods, contraception, breast-feeding preferences, confinement period and care, postmenopausal intake and influence of the traditional healer. Breast cancer is the most common cancer among Malaysian women across all three ethnicities. However, the National Cancer Registry and local medical centres have documented ethnic differences in breast cancer risk (Chinese, 40.7 per 100,000; Indian, 38.1 per 100,000; Malay, 31.5 per 100,000), peak age (youngest in the Malays), stage at presentation (largest percentage at advanced stage among the Malays) and survival (poorest survival rate among the Malays). The Malays have several practices that are protective against breast cancer compared with the Chinese. However, the Malays have strong beliefs in the traditional healer, which contribute to the delay in getting treatment, causing a poor outcome and a low survival rate. The highest BRCA1 and 2 genetic mutation incidence is amongst the Chinese, but the Malays have the largest triple-negative breast cancer rates. These factors may also contribute to the statistical breast cancer data.

## Contents

1. Introduction
2. Dietary habits
3. Confinement diet

4. Fertility rate
5. Breastfeeding
6. Postmenopausal diet
7. Traditional healer
8. Genetic mutations
9. Cumulative overall survival
10. Comparison between three ethnic groups
11. Conclusion

## 1. Introduction

Worldwide, breast cancer is the second most commonly diagnosed cancer when statistics for both sexes are combined. For women, breast cancer is the most commonly diagnosed cancer and the leading cause of mortality (1). In Asia, the most common cancer types in women are breast, lung, cervical, colorectal and stomach cancer. The mortality-to-incidence ratios are the highest in lung, liver and stomach cancer, and the lowest in colorectal, breast and prostate cancer (2). In 2012, there were 639,824 cases of breast cancer recorded in Asian countries, with 228,926 deaths. Malaysia recorded 5,410 cases of breast cancer, with 2,572 deaths, in 2012 (3). Based on Malaysia's 2016 National Cancer Registry, a total of 21,634 cases of female breast cancer were diagnosed over a period of 4 years between 2012 and 2016 compared with 18,206 cases in the 2007-2011 report. Breast cancer is the most common cancer and has accounted for 34.1% of all cancer cases among women in Malaysia. The age-standardised rate was increased from 31.1 per 100,000 population in 2007-2011 to 34.1 between 2012 and 2016 (4).

Malaysia is a developing country made up of three main ethnicities: Malay, Chinese and Indian. Multi-ethnicity in Malaysia started after the establishment of the Straits Settlements in Penang, Malacca and Singapore, and later on, the acquisition of the Malay territories by the British. These British colonizers brought in a number of labourers from China and India to work on the land (5). The Chinese migrants were placed to work in tin mines, whilst the Indian population laboured in the rubber plantations.

With regard to the breast cancer incidence rate among the three major ethnic groups, the incidence is highest among

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the Chinese (40.7 per 100,000 individuals) followed by the Indians (38.1 per 100,000 individuals) and the Malays (31.5 per 100,000 individuals). The overall lifetime risk is 1 in 22 for the Chinese, 1 in 23 for the Indians and 1 in 30 for the Malays (4). The Malays have been observed to be significantly younger at the time of cancer presentation (average, 50 years old) compared with the Chinese (average, 57 years old) and Indians (average 56 years old). The Malays also have a more advanced stage at diagnosis compared with the other two ethnic groups (6). The Malay ethnicity was observed to be a poor prognostic factor in breast cancer, conferring 1.5 times the risk of death compared with the Chinese ethnicity (7). Similarly, it was noted that the Malays had a lower survival rate of 39.7% compared with 48.2% in the Chinese and 47.2% in the Indians (8). These Malay women presented with the more advanced stages compared with the women of the other two ethnicities, and had the worst survival rate (9,10). Singapore, which is a multi-ethnic country similar to Malaysia, also reported a similar breast cancer incidence rate that was higher among Chinese women compared with that among the Malays and Indians (11). Table I shows the statistics of breast cancer among the different ethnic groups.

Although there has been ethnic integration, and the occurrence of marriages between ethnicities, each group has largely retained its own unique culture and way of life. In Malaysia, the statistical data combines the Malays with the smaller indigenous groups to form the Bumiputera group. The Malays (Bumiputera) now make up 69.6% of the population, the Chinese 22.6% and the Indians 6.8%, with the remaining percentage being constituted from the other ethnic minorities. The total population now stands at 32.6 million people (12).

According to a review of the literature, to the best of our knowledge, there has been only one paper discussing the possible causes or correlation between the lifestyle and culture of the three ethnicities in Malaysia and breast cancer risk (13). However, this paper lacks references for a number of the points that were raised. A large part of this paper discussed the general lifestyles that had led to Malaysian women developing cancer as a whole, but did not compare the practices between the different ethnicities, as the title had suggested.

The present review comprehensively analyses different cultural practices and how they may have affected the risk, stage at presentation and outcome of women with breast cancer in Malaysia, a multi-ethnic developing country. The significant ethnic differences appear to be in the type of daily food and cooking methods, contraception, fertility rates, breast-feeding practices, confinement period and care, postmenopausal intake and influence of the traditional healer, which are all discussed.

## 2. Dietary habits

As in most cases, dietary practices play a big role with regard to health. The three ethnic races in Malaysia have their preferences in food preparation. The Malays and the Indians use a lot of turmeric or curcumin in their routine cooking, consisting of curries and other spicy gravies. Curcumin is a polyphenol from the plant *Curcuma longa*. Although not a phyto-oestrogen, it has been shown to inhibit the proliferation of various breast

cancer cell lines and also to induce the apoptosis of breast cancer cells (14). Curcumin has also been found to minimise the risk of metastases in breast cancer by downregulating the inflammatory cytokines C-X-C motif chemokine ligand 1 and 2 via nuclear factor- $\kappa$ B, an inflammation- and cell survival-related transcription factor (15).

The typical Chinese diet does not include turmeric. Instead, a lot of soya (soy) products, consisting of soya sauce, bean curd and soya-bean drink, are used. Soya beans fall in the isoflavones category of phyto-oestrogens. In a dose-response meta-analysis report, each increment of 10 mg/day soy isoflavone was associated with a 3% decreased breast cancer risk (16). Phyto-oestrogens are very weak mimickers of natural oestrogens, with an affinity for oestrogen receptors of 1,000-10,000 times lower than oestradiol (17). There are two types of oestrogen receptors (ERs), ER- $\alpha$  and ER- $\beta$ . Stimulation of ER- $\alpha$  causes an increase in tumour growth, but stimulation of ER- $\beta$  causes tumour regression. Oestradiol has equal affinity for both types of ERs. Tamoxifen has double the affinity for ER- $\beta$  compared with that for ER- $\alpha$ . However, phyto-oestrogens have five times greater affinity for ER- $\beta$  compared with that for ER- $\alpha$  (18). A bi-phasic behaviour of isoflavones has also been observed *in vitro*, whereby a low dose stimulated the growth of MCF-7 cells (ER-positive breast cancer cell line), but not MDA-MB cells (ER-negative breast cancer cell line). At high doses, isoflavones inhibit the growth of both ER-positive and -negative cell lines (19,20). Another important Chinese cooking ingredient is sesame, which is consumed as seeds and as sesame oil (21). Sesame seeds contain a lignan, which is also a type of phyto-oestrogen. However, its chemical compound, enterolactone, is metabolized in the gut and may have limited effects on humans (17).

In another study, a low dietary fibre intake was associated with higher risks of developing breast cancer (22). In a nutrient-wide association study, it was reported that a high intake of fibre and fruits was associated with a lower breast cancer risk (23). It was found that the total consumption of vegetables and fruits differ amongst the different ethnic groups in Malaysia. The Malays have the highest consumption, followed by the Chinese and the Indians (24), and this may influence breast cancer risk in these ethnic groups.

In Malaysia, alcohol consumption is significantly higher among males compared with females. Among the three ethnic groups, binge drinking was recorded to be highest in the Indians (54%), followed by the Chinese at 39% and the Malays at 8% (25). The Malay women, who are Muslims, do not consume alcohol as it is forbidden in Islam. Some Chinese women consume alcohol on social occasions and some Indian women in the estates consume illicit alcohol (samsu) (26). Frequent and high consumption of alcohol are risk factors for breast cancer, as shown in a study among premenopausal women in Japan (27). Similarly, one report identified alcohol as one of the environmental factors related to cancer (28). Due to the differences in alcohol consumption among the ethnic groups, breast cancer risk and incidence may also differ.

## 3. Confinement diet

Across the three ethnicities, the confinement period is traditionally regarded important in order to protect the well-being

Table I. Statistics of breast cancer and genetic mutations among the different ethnic groups in Malaysia.

Statistic	Malay	Chinese	Indian	(Refs.)
Incidence (per 100,000) in a 5-year period				(4)
2007-2011	27.2	41.5	37.1	
2012-2016	31.5	40.7	38.1	
Overall lifetime risk	1 in 30	1 in 22	1 in 23	(4)
Age at presentation, years	50	57	56	(6)
	46	51	53	(9)
Metastatic disease at presentation, %	14.2	9.2	11.9	(6)
	16	9	4	(9)
Median tumour size at diagnosis, mm	35	25	30	(9)
Oestrogen receptor-positive tumours, %	52.5	58.1	52.5	(9)
Oestrogen receptor-negative tumours, %	47.5	41.9	47.5	(9)
High-grade tumours, %	44.7	39.4	43.9	(9)
Malaysian 5-year survival rate, %	39.7	48.2	47.2	(8)
Malaysian average survival time, years	6.41	7.10	6.45	(10)
Malaysian-Singapore 5-year survival rate, %	58.5	75.8	68	(9)
BRCA1 and 2 mutations, %	23.5	63.1	11.8	(65)

of the woman, as it allows the body to recuperate and recover from childbirth. At the time, certain dietary practices are observed. 'Hot foods' are recommended. 'Hot foods' refer to spicy food, with the effect of making the one eating it sweat easily. The Malay confinement period lasts 44 days in which the new mother would be required to wear a special corset (*bengkung*) (29). Firstly, two large rectangle pieces of cloth are sewn together with a central compartment filled with spices; this is placed over the front of the belly. Next, a long plain piece of cloth is wrapped snugly around the body, over the spice-filled piece, starting from the upper down to the lower abdomen. The new mother would undergo whole body massage daily. Warm compression from heated stones would be placed on the abdominal wall for several minutes at a time, daily, over 3-7 days; this is similar to the application of a hot water bottle. The confinement diet consists of not only young tubers of turmeric, but also its young shoots. Other foods consist of the snake-head fish (ikan haruan), anchovies, meat, ginger, black pepper and a herb locally known as Kacip Fatimah [*Labisia pumila* (LP)]. This herb has been found to have cytotoxic activity against the MCF-7 breast cancer cell line (30,31), prostate cancer cell lines (32,33) and melanoma cells (34). It has also been found to have anti-fungal and anti-inflammatory properties (30), including bronchodilatory properties (35).

The confinement period for Chinese women is a month. The confinement diet consists of large amounts of ginger and sesame, as well as special brews in the form of rice wine in which chicken and pork trotters had been simmered. Some women are also given additional drinks such as Dom Pérignon, a French wine, which is highly regarded by the Chinese to be good for women during confinement (21).

During the confinement period, Chinese women are also given Ginseng (*Panax ginseng*) and Dong Quai or Tong Kuei (*Angelica sinensis*). Traditionally known as 'female ginseng', Dong Quai is often given to women at other times too. Amongst its indicated properties are the improvement of

fertility and libido, and the treatment of dysmenorrhoea and premenstrual syndrome (21). Amato *et al* (36) showed that, *in vitro*, Dong Quai and Ginseng increased breast cancer cell line multiplication by 16 and 27 times, respectively. However, recent studies (37,38) have shown conflicting findings. Dong Quai did not exert significant stimulatory effects on breast cancer in both an *in vivo* breast tumour xenograft-bearing nude mouse model and in an *in vitro* human breast cancer cell line. However, precaution is required if Dong Quai is to be used in oestrogen receptor-positive breast cancer patients due to its ability to induce oestrogen receptor- $\alpha$  expression and its tumorigenic potential via promotion of cancer stem cell activity in oestrogen receptor-positive breast cancer (39,40). Ginseng has also been shown to inhibit the proliferation of breast cancer cell lines in a time- and dose-dependent manner by activating the apoptotic pathway (41).

Similar to the Chinese, the Indian women undergo a confinement of 30 days. However, their diet is very different from that of Chinese women. Indian women avoid 'cooling foods' such as cucumber, murungai (*Moringa oleifera*) fruits and grapes, but are encouraged to consume more spices such as black pepper, cardamon, aniseed, turmeric and ginger (42). In a study conducted in Singapore, Indian women were also observed to increase their consumption of garlic (43). A high consumption of garlic has been shown to have an inverse association with breast cancer, as reported in a study conducted among women aged 39-70 years in Puerto Rico (44).

#### 4. Fertility rate

The fertility rates of the three ethnicities differ, with the highest amongst Malay women and the lowest among Chinese women (12). There is a close association between breast cancer and parity, whereby increased parity or fertility lessens breast cancer risk (28).

In 2014, it was found that 52% of Malaysian women practiced family planning consisting of both non-modern and modern

methods. The most favoured modern contraception was the oral contraceptive pill (OCP) at 13.2% usage (45). Contraceptive practices also differed between the ethnicities, with the pill being used the most by Chinese women (45.6%), followed by the Indian (32.2%) and Malay (28.2%) women (46). Use of the OCP has been shown to increase breast cancer risk (28).

### 5. Breastfeeding

Breastfeeding is beneficial to both the mother and the child. For the mother, there is an association with a decreased breast cancer risk if the baby is breastfed for >6 months (28). Local data have shown that a higher percentage of Malays tend to breastfeed longer compared with the percentage of Chinese (47). In one study, it was determined that Chinese women who were working, from a high income family and with male infants were less likely to breastfeed their baby (48). In a study that analysed a group of 682 women (Malays, 60.9%; Chinese, 18.7%; and Indians, 16%), it was found that exclusive breastfeeding for the first 6 months was practised by 52.5% of the Malays, 15.6% of the Chinese and 35.8% of the Indians (49).

### 6. Postmenopausal diet

Similar to during the confinement period, LP is also commonly taken by Malay women postmenopause. The menopause is associated with several symptoms and mental health changes (vasomotor symptoms and cognitive function), as well as changes in physiological systems and functions (cardiovascular and bone health) (50). In rats who were given LP and oestrogen, the collagen fibres that held the adipocytes together became fragmented causing lipolysis. This showed that there is a possible role for LP in preventing postmenopausal obesity (51). Additionally, a study by Fazliana *et al* (52) showed that the plant caused an increase in the production of leptin, leading to weight loss and improvement in insulin sensitivity. Nadia *et al* (53) demonstrated the anti-oxidative role of LP, and Abdul Kadir *et al* (54) found it to lower serum triglyceride levels. High triglyceride levels have been shown to be associated with coronary heart disease in postmenopausal women (55,56).

A study comparing LP with premarin, one of the medications used for hormone replacement therapy, showed that LP did not prevent the loss of bone mass (57). However, another study in animal models showed it to be comparable to premarin in preventing osteoporotic fractures in oestrogen-deficient states (58). A pilot study on women administered LP extracts demonstrated no increase in mammographic density (59). This is important, as an increase in mammographic density would make interpretation more difficult and has been shown to increase breast cancer risk (60,61).

Just like in Chinese women during the confinement period, Chinese postmenopausal women take Dong Quai to treat vasomotor symptoms (21). As shown by Amato *et al* (36), these menopausal women now have an added risk of developing breast cancer due to this consumption.

### 7. Traditional healer

According to the Malay culture, the traditional healer or medicine man, known as a 'bomoh', is much respected in society.

This is especially so among the rural population (62). Often, the services of the healer is sought after for numerous illnesses in both children and adults. These include physical illnesses, spiritual illnesses and those believed to be related to sorcery or black-magic. Even family related issues like infidelity, separation, divorce or the search for a life partner often involve seeking the advice of the healer.

In Malaysia, the highest users of traditional and complementary treatment are the Sabah Natives, followed by the Malays (63). Among all patients with breast cancer, there are several reasons for seeking traditional healers, including recommendations from family members and friends, sanction from family, perceived benefit and compatibility, healer credibility, and reservation towards Western medicine and system delays (64).

For physical lesions, one of the common taboos conveyed by these healers is contact of the affected body part with metal objects. Those who follow these orders would not come to hospital, as often a biopsy would need to be taken, which would involve the use of metal needles. When the treatment from a particular healer did not work or the illness did not go away, a second or third bomoh would be consulted. Only after failing these treatments, which could lead to a delay of 6 to 12 months, would these women present themselves to a hospital. This accounts for the late diagnosis at stages 3 or 4 for Malay women with breast cancer. As expected, these women with more advanced diseases have poorer outcomes. Among the three ethnicities, the Malay women are the worst affected in this regard (8-10).

### 8. Genetic mutations

Genetic research performed by Thirthagiri *et al* (65) discovered that Chinese women had the highest incidence of BRCA1 and 2 mutations at 63.1%, followed by Malay women at 23.1% and Indian women at 11.8%. Among the Chinese women, there was an equal proportion of BRCA1 and 2 mutations. There was more BRCA2 mutations among the Malays. These mutations led to early onset breast cancer (age  $\leq$ 40 years). A total of 27 deleterious mutations were detected (14 in BRCA1 and 13 in BRCA2), and 47 variants of uncertain clinical significance were identified (16 in BRCA1 and 31 in BRCA2). This study may significantly contribute to the current statistical evidence on incidence of breast cancer by ethnicity.

### 9. Cumulative overall survival

The cumulative overall survival of Malaysian and Singaporean women (9) was demonstrated in a full model adjusted for socio-demographic factors, tumour characteristics and treatment (Fig. 1). The findings showed that the cumulative overall survival rate was lowest for Malay women. This data was also supported by results from other previous studies (8,10).

### 10. Comparison between three ethnic groups

Chinese women who have the lowest fertility rate, highest OCP use, poorest breast feeding practices and highest alcohol intake are associated with increased breast cancer risks. Soya seems to be associated with decreased cellular proliferation *in vitro*. However, a diet rich in soya alone, as one beneficial factor, would not be able to overcome all the other negative

Table II. Cultural practices of the three major ethnic groups in Malaysia and breast cancer risks.

A, Dietary habits		
Ethnicity	Practice	Breast cancer risk
Malay	Turmeric/curcumin consumption	Reduced risk: Curcumin inhibits proliferation and induces apoptosis of breast cancer cell lines (14)
	High consumption of vegetables and fruits	Reduced risk: High dietary fibre reduces breast cancer risk in a study of Malaysians compared with controls (22) Women, aged 25 to 70 years, followed-up for 15 years, in the European Prospective Investigation into Cancer and Nutrition Study showed that high fibre intake reduced breast cancer risk (23)
Chinese	Soy product consumption	Reduced risk: A meta-analysis of Chinese women (aged 30-79 years) followed up for 10 years and other studies in Asia and Western countries found that an increase in soy intake reduced breast cancer risk (16)
	Alcohol consumption	Increased risk: Alcohol consumption is a risk factor for breast cancer in premenopausal women (25)
Indian	Turmeric/curcumin consumption	Reduced risk: As aforementioned (14)
	Alcohol consumption	Increased risk: As aforementioned (25)
B, Confinement diet		
Ethnicity	Practice	Breast cancer risk
Malay	Turmeric/curcumin consumption	Reduced risk: As aforementioned (14)
	Kacip Fatimah ( <i>Labisia pumila</i> ) consumption	Reduced risk: Cytotoxic activity against the MCF-7 breast cancer cell line (30,31)
Chinese	Alcohol consumption	Increased risk: As aforementioned (25)
	Ginseng and Dong Quai ( <i>Angelica sinensis</i> ) consumption	Conflicting reports: Recent studies showed that Dong Quai did not induce breast cancer but caution use in oestrogen receptor-positive breast cancer patients, while ginseng inhibits growth of breast cancer cell lines (37,38)
Indian	Turmeric/curcumin	Reduced risk: As aforementioned (14)
C, Fertility rate		
Ethnicity	Practice	Breast cancer risk
Malay	Highest parity rate, lowest usage of OCP	Reduced risk: Increased parity lessens breast cancer risks (28)
Chinese	Lowest parity rate, highest usage of OCP	Increased risk: Use of OCP increase breast cancer risk (28)
Indian	Parity and usage of OCP ranking between that of the Malays and the Chinese	Medium risk
D, Breastfeeding		
Ethnicity	Practice	Breast cancer risk
Malay	Most practiced	Reduced risk: Decrease breast cancer risk if breastfeeding for >6 months (28)
Chinese	Least practiced	Increased risk: No breast feeding protective effect against breast cancer (27)
Indian	In between the Malays & the Chinese	Reduced risk: Decrease breast cancer risk if breastfeeding for >6 months (28)

Table II. Continued.

E, Postmenopausal diet		
Ethnicity	Practice	Breast cancer risk
Malay	Kacip Fatimah ( <i>Labisia pumila</i> ) consumption	Reduced risk: As aforementioned (30,31)
Chinese	Dong Quai ( <i>Angelica sinensis</i> ) consumption	Conflicting reports: As aforementioned (37)
Indian	Data not available	Data not available

F, Traditional healer		
Ethnicity	Practice	Breast cancer risk
Malay	Strong belief	Increased risk: These women had the worst outcome (8-10)
Chinese	No strong belief	No increased risk
Indian	No strong belief	No increased risk

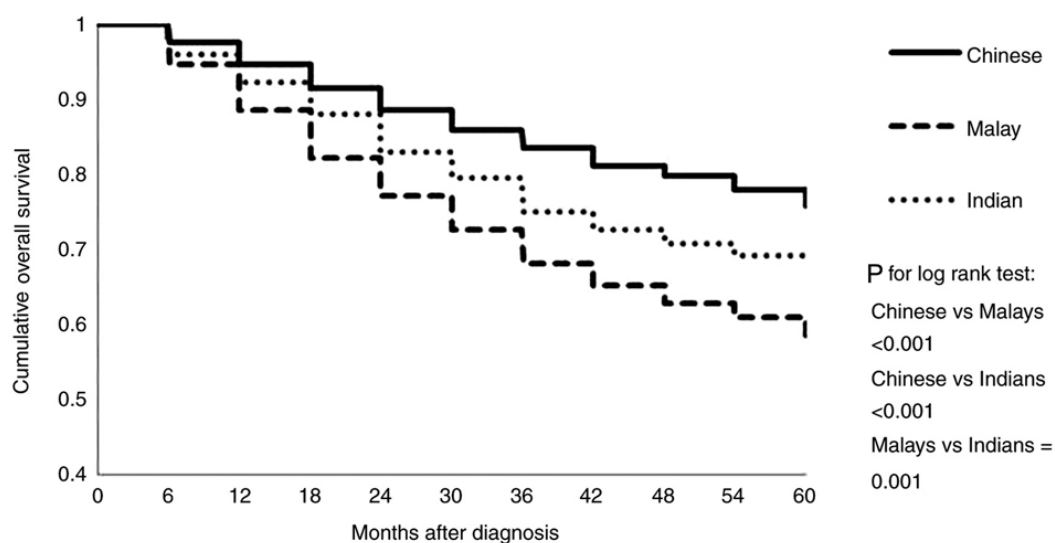


Figure 1. Cumulative overall survival by ethnicity in 5,264 South East Asian women with breast cancer. From Nirmala Boo-pathy (9), doi: 10.1371/journal.pone.0030995.g001.

lifestyle practices. With the added factor of having the highest incidence of BRCA1 and 2 genetic mutations amongst the three ethnicities, it is not unexpected that Chinese women have the highest risk of breast cancer.

In comparison, Malay women have the highest fertility rate, lowest OCP usage, best breast feeding practices, no alcohol consumption and the intake of a herb (Kacip Fatimah) with *in vitro* cytotoxic properties. All of these are in favour of lowering breast cancer risks. The setback among this group is a strong belief in the traditional healer, which causes late presentation to hospitals and poor survival outcomes.

The practices observed by Indian women come between those practiced by the Chinese and the Malays, which put them second highest in terms of breast cancer risk. Table II summarizes the differences in cultural practices among the three ethnic groups and the influence on breast cancer risk.

A large part of the aforementioned herbal research showed findings from *in vitro* studies and animal models, with

limited studies in humans. Although this is a commendable start, further clinical trials need to be completed in order to produce more robust data to facilitate the use of such herbs in the clinical setting. From the current data, LP appears a safer option than hormone replacement therapy, which is associated with elevated breast cancer risks according to the Women's Health Initiative study, plus increased risks of stroke and thromboembolic diseases (66).

The peak age of breast cancer in Malay women is lower compared with that in Chinese and Indian women (6,9). This may be related to the different cancer subtypes among the ethnic groups. The luminal A subtype occurs significantly more frequently in the Chinese than in the Malays. However, the percentage of triple-negative subtype cases is significantly higher in the Malays than in the Chinese (67). Triple-negative breast cancer has been associated with a younger age at the time of diagnosis and a more advanced disease stage (68). However, when Asians as a whole are considered, the peak

age of breast cancer incidence is between 40 and 50 years old, as opposed to between 60 and 70 years old in Western countries (69). Biological, genetic and the environmental factors may contribute to these differences.

## 11. Conclusion

Based on the data presented, the three ethnicities have distinct cultural practices that may influence breast cancer occurrence. The lowest incidence of breast cancer in the Malays may be attributable to their lifestyle and cultural practices. However, the Malays present with the disease at an advanced stage and have a low survival rate. It is hoped that the three ethnicities will learn from each other and adjust their cultural practices. This would mean continuing the beneficial practices and abandoning the detrimental ones. This is a challenging task and may take a longer time, as often traditional changes occur more easily with a newer generation. Some individuals may have sensitive sentiments attached to their cultural practices and will oppose changes. The government and non-government organisations would need to work together to educate the public to increase their breast cancer awareness and advocate the best lifestyle practices. This would be the best way forward in an attempt to decrease the incidence of breast cancer and improve the outcome at a national level as Malaysia strives forward to become a developed country in the future. Besides Malaysia, the aforementioned information may be beneficial to Asians worldwide who share a similar lifestyle and diet.

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## Authors' contributions

NA conceptualized the study and prepared the original and final drafts. NM reviewed and edited the article. All authors have read and approved the manuscript. Data authentication is not applicable.

## Ethics approval and consent to participate

Not applicable.

## Patient consent for publication

Not applicable.

## Competing interests

The authors declare that they have no competing interests.

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