CHAPTER 4 : FINDINGS

4.1 Introduction

This chapter presents the systematic review results in phase One, quantitative results of the phase Two study, followed by the accurately transcripted voices of the respondents and the themes that emerged from the qualitative findings in phase Three.

For systematic reviews, the outcome measure of interest was the prevalence of Orang Asli with behavioural and metabolic risks of NCDs. While for the quantitative study, the descriptive results mainly outline the demographic characteristics of the study sample while the inferential statistic results highlight the observed correlations between knowledge, attitude and practices score. The associations between independent variables and major NCDs also presented. As for the qualitative findings, the data were organised into subthemes before being analysed to reveal the major theme.

4.2 Systematic Reviews Results

4.2.1 Behavioural Risk Factors of NCDs

4.2.1.1 Study Selection

From personal communication with the Institute for Public Health Malaysia, no data for behavioural risks of NCDs were available specifically for the Orang Asli categories. Instead, all the Orang Aslis were grouped under the Other Bumiputera

category that also included the Indigenous people from Sabah and Sarawak in East Malaysia. The letter of their reply is shown in Appendix 15.

The search was performed on the 26th of March 2019. A total of 1632 potentially relevant citations were retrieved, of which 57 were duplicate citations and thus removed. Screening the title and abstract further excluded another 1527 citations. Full papers were then reviewed, and only 12 citations met the inclusion criteria. The process of each step in the review is described in Figure 4.1.

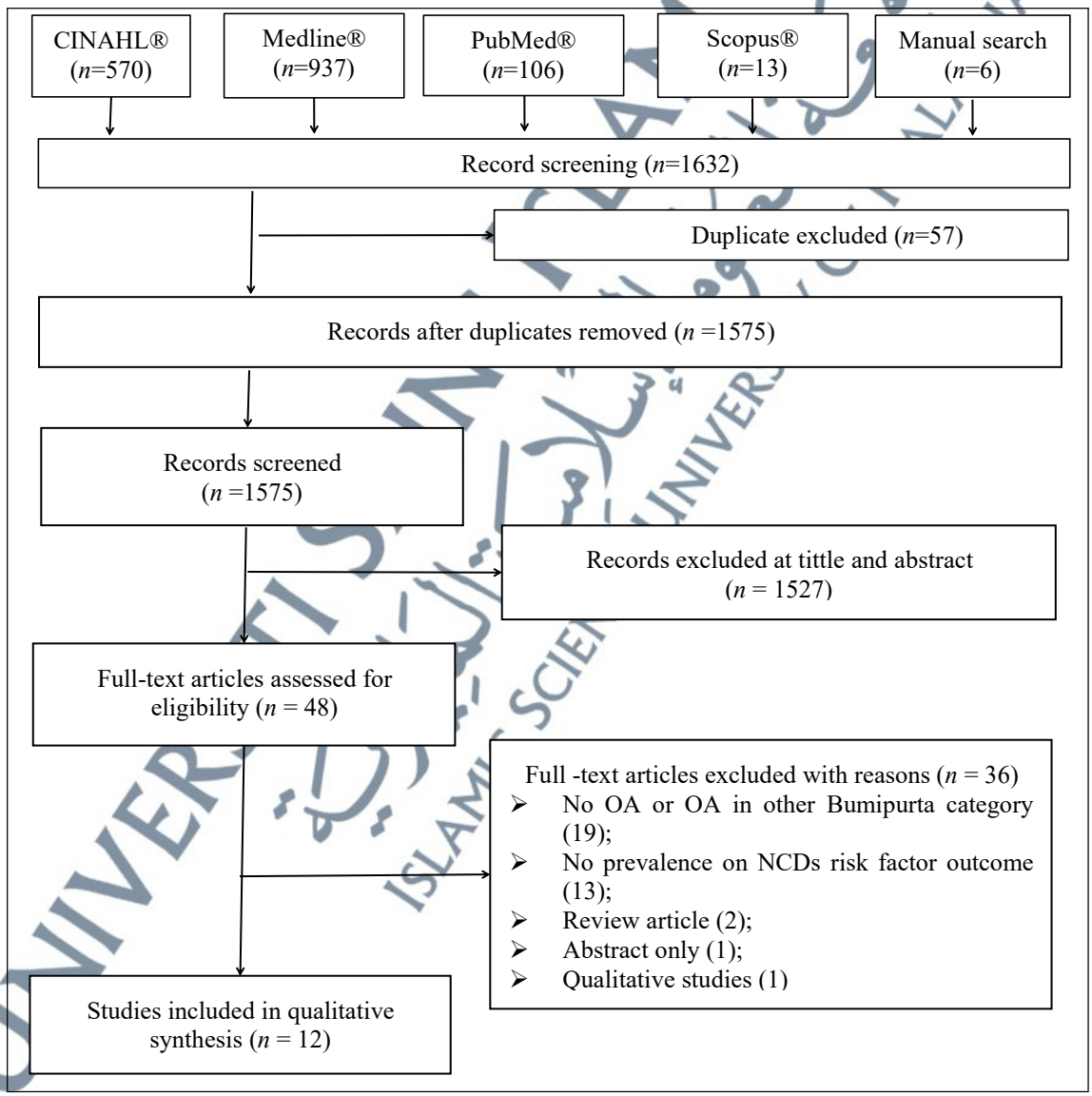

Figure 4.1: PRISMA Flow Diagram Study Selection Process on Behavioural Risk Factors of NCDs

The publication trend and the years of study being conducted are shown in Figure 4.2. The first study was published in 1991 (1 citation). There was a long gap after that until 2007 whereby there was one publication each years for 2007 (1 citation), 2010 (1 citation), 2011 (1 citation), 2012 (1 citation), 2013 (1 citation), 2014 (1 citation), 2016 (1 citation) and 2017 (1 citation). The latest publication was found in 2018 with 3 citations.

In terms of the year the study being conducted, the earliest was the study published in 2002 while the latest reported year of research done was in 2015. Four citations did not report when the study was conducted, included the earliest publication in 1991. The publications stagnated from 1991 to 2006 and only started to increase after 2007. The increase was triple in the year 2018. However, the latest reported year of research done was in 2015.

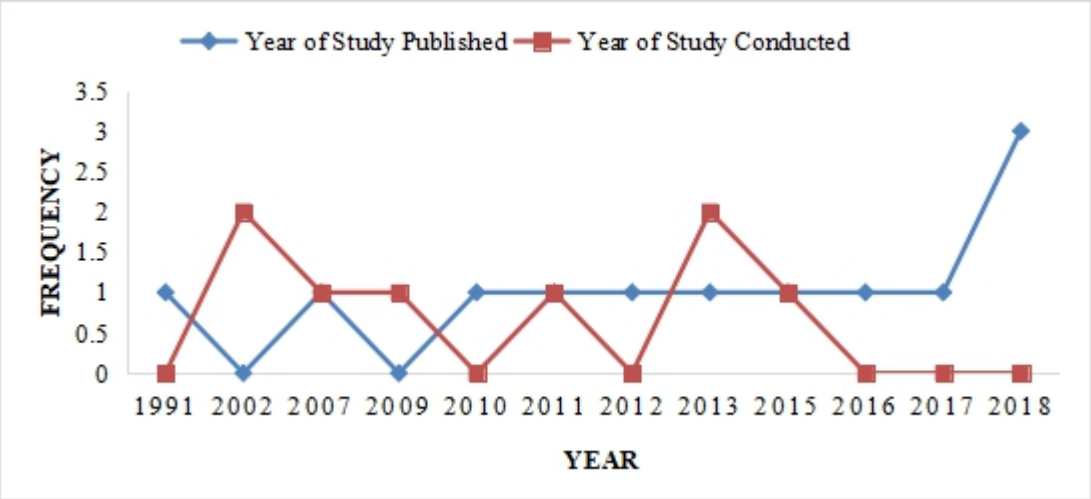

Figure 4.2: Trend for the Studies on Behavioural Risk Factors of NCDs by Years and Count

4.2.1.2 Study Characteristics

The characteristics of each study are provided in Table 4.1. All the studies were observational cross-sectional studies. The study sample size ranged from thirteen to 482 adults. The minimum age in the studies was 15. All the studies

involved both genders. Among the eight studies that reported the number of respondents based on gender, seven (87.5%) studies had a higher number of female respondents.

Table 4.1: Characteristics for Behavioural Risk Factors of NCDs Studies

Author, years	Period	Study design	Respondents and Setting			
			n	State	Age,mean(*SD*)	Tribe
Ali, Shamsuddin & Khalid (1991)	NR	Cross-sectional	50	Selangor	37.6 (13.4)	Temuan, Jahai
Yusof et al. (2007)	2002	Cross-sectional	138 M:35.5% F:64.5%	Perak	16-70, 29.2 (12)	Jahai, Temiar
Poh et al. (2010)	2002-2003	Cross-sectional	29	NR	18-59	NR
Ngui et al. (2011)	2007-2009	Cross-sectional	167	NR	18-83, 36.34 (13.78)	Semai, Mah Meri, Temuan, Semelai, Jakun, Orang Kuala
Othman et al. (2012)	NR	Cross-sectional	35 M: 22.9% F: 77.1%	Selangor	40.8 (20.8)	Semai
Ahmad et al. (2013a)	2009-2010	Cross-sectional	385 M:36.1% F:63.9%	Johor, Selangor, Perak	15-82, 36.4 (14.0)	Selentar,Mah Meri, Kintak
Cheng et al. (2014)	2011	Cross-sectional	13 M:61.5% F:38.5%	Perak	18-69	Lanoh
Pell et al., (2016)	2013-2014	Cross-sectional	127	Johor	16-35	NR
Chua et al. (2017)	NR	Cross-sectional	482 M:46.3% F:53.7%	Pahang	18 above, 35.4	Jah Hut, Temuan, Che Wong
Ahmad et al. (2018)	2013	Cross-sectional	133 M:27.1% F:72.9%	Perak	18 above, 35.5	NR
Rohin et al. (2018)	NR	Cross-sectional	58 M: 25.9% F:74.1%	Kelantan	18-60, 36.69 (1.28)	Temiar
Wong et al. (2018)	2015	Cross-sectional	74 M:38.9% F:61.6%	Pahang	18 above, median= 39.5	Jakun

Abbreviations: M, Male; F, Female; NR, Not reported; *SD*, Standard deviation

The number of studies conducted among the three main tribes of Orang Asli is shown in Figure 4.3. Three studies (Poh et al., 2010; Pell et al., 2016; Ahmad et al., 2018) did not specify the Orang Asli tribe involved in the study. For the studies

conducted amongst specific tribes; three studies amongst Temuan (Ali, Shamsuddin & Khalid, 1991; Ngui et al., 2011; Chua et al., 2017). Two studies were done within the Jahai (Ali, Shamsuddin & Khalid, 1991; Yusof et al., 2007), Jakun (Ngui et al., 2011; Wong et al., 2018), Mah Meri (Ngui et al., 2011; Ahmad et al., 2013a), Temiar (Yusof et al., 2007; Wong et al., 2018), Temuan (Ali, Shamsuddin & Khalid, 1991; Ngui et al., 2011), and Semai (Ngui et al., 2011; Othman et al., 2012) groups respectively. One study each was conducted among the following tribes of Semelai and Orang Kuala by Ngui et al. (2011), Seletar, and Kintak by Ahmad et al. (2013a), Lanoh by Cheng et al. (2014) and Che Wong and Jah Hut by Cheng et al. (2017).

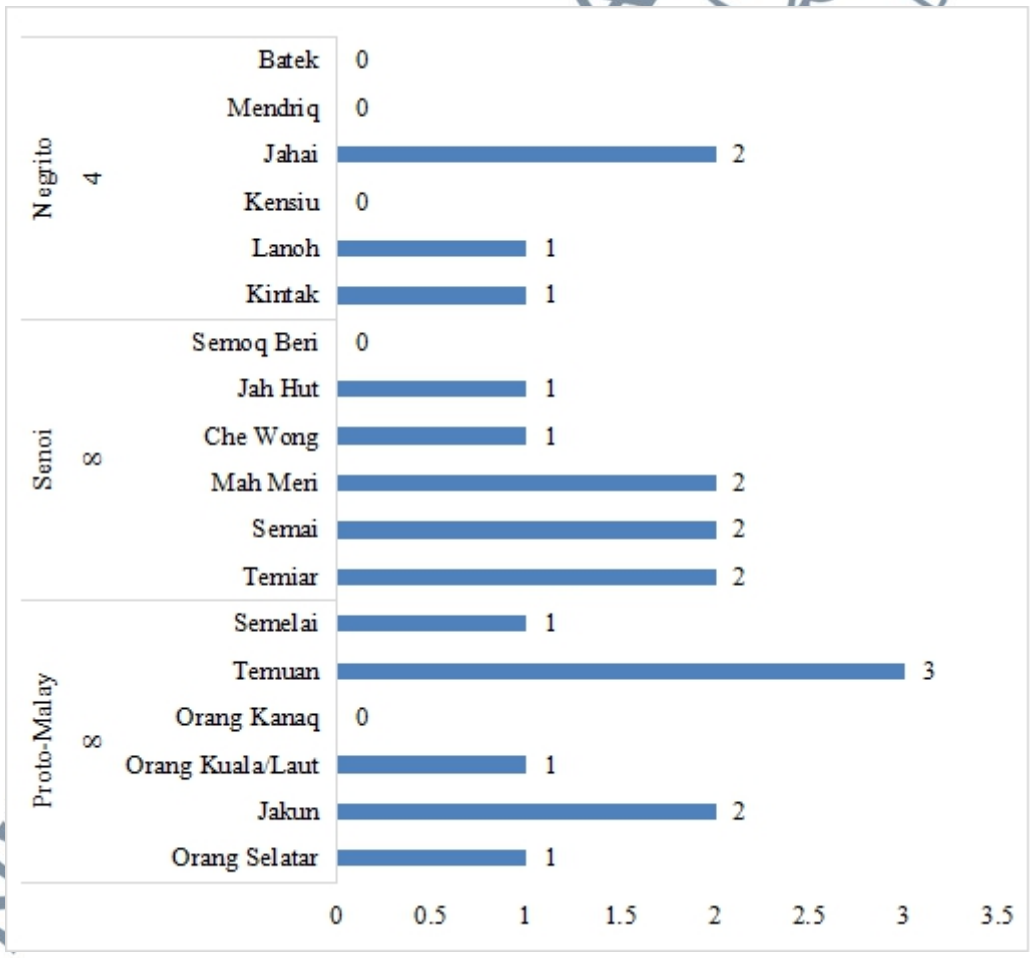

Figure 4.3: Number of Studies Conducted on Behavioural Risk Factors of NCDs

4.2.1.3 Risk of Bias within Studies

Table 4.2 provides a detailed description of the methodological quality of the included studies. Eight (66.7%) out of the twelve included studies in this review received a quality score of more than or equal to five. Citations by Poh et al. (2010) and Chua et al. (2017) with eight, followed by Wong et al. (2018) with seven, Ngui et al. (2011) and Pell et al. (2016) with six score and Yusof et al. (2007), Ahmad et al. (2013a) and Rohin et al. (2018) had a quality score of five.

In terms of the selection of respondents, most of the studies did not provide any description of the sampling strategies (Ali, Shamsuddin & Khalid, 1991; Othman et al., 2012; Ahmad et al., 2018; Rohin et al., 2018). The sample size was not justified or described satisfactorily in the studies conducted by Ali, Shamsuddin & Khalid (1991), Yusof et al. (2007), Ngui et al. (2011), Othman et al. (2012), Ahmad et al. (2013), Cheng et al. (2014), Pell et al. (2016), and Rohin et al. (2018). Only three studies reported the response rate, namely Poh et al. (2010), Ngui et al. (2011), and Wong et al. (2018).

The outcome assessment was measured using self-reported methods since all the studies collected data using the method of survey. All the studies used appropriate statistical test that was clearly described to analyse the data.

4.2.1.4 Prevalence of Smoking

The summary for the prevalence of smoking behavioural risk factor shown in Table 4.3. Seven studies reported that the prevalence of smoking among the Orang Asli ranged from 27.8 % to 56.9 %. All studies used 'current smoker' as the exposure definition. The weighted mean prevalence for smoking behaviour was 45.8%.

Table 4.2: Quality Assessed for Behavioural Risk Factors of NCDs Studies

Reference	Selection (5)				Comparable (2)	Outcome (3)		Total (10)
	Representativeness of the sample	Sample size	Non-respondents	Risk factor ascertainment	Confounding factors	Outcome assessment	Statistical test	
Ali, Shamsuddin & Khalid (1991)	No description	Not justified	No description	Tool is available or described*	Control for any additional factor *	Self-report *	Clearly described and appropriate *	4
Yusof et al. (2007)	Somewhat representative *	Not justified	No description	Tool is available or described*	Control for any additional factor *	Self-report *	Clearly described and appropriate *	5
Poh et al. (2010)	Truly representative *	Justified and satisfactory *	Comparable and response rate is satisfactory. *	Validated measurement tool. **	Controls most important factor *	Self-report *	Clearly described and appropriate *	8
Ngui et al. (2011)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory. *	Tool is available or described*	Control for any additional factor *	Self-report *	Clearly described and appropriate *	6
Othman et al. (2012)	No description	Not justified	No description	Tool is available or described*	None	Self-report *	Clearly described and appropriate *	3
Ahmad et al. (2013a)	Somewhat representative *	Not justified	No description	Tool is available or described*	Control for any additional factor *	Self-report *	Clearly described and appropriate *	5
Cheng et al. (2014)	No description	Not justified	No description	Tool is available or described*	None	Self-report *	Clearly described and appropriate *	3

Table 4.2, continued

Reference	Selection (5)				Comparable (2)	Outcome (3)		Total (10)
	Representativeness of the sample	Sample size	Non-respondents	Risk factor ascertainment	Confounding factors	Outcome assessment	Statistical test	
Pell et al. (2016)	Somewhat representative *	Not justified	No description	Validated measurement tool. **	Control for any additional factor *	Self-report *	Clearly described and appropriate *	6
Chua et al. (2017)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment**	Clearly described and appropriate *	8
Ahmad et al. (2018)	Selected group	Justified and satisfactory*	No description	Tool is available or described*	None	Self-report *	Clearly described and appropriate *	4
Rohin et al. (2018)	No description	Not justified	No description	Validated measurement tool. **	Control for any additional factor *	Self-report *	Clearly described and appropriate *	5
Wong et al. (2018)	Somewhat representative *	Justified and satisfactory *	Comparable and response rate is satisfactory *	Tool is available or described*	Controls most important factor. *	Self-report *	Clearly described and appropriate *	7

The highest prevalence was 56.9% in the study conducted by Wong et al. (2018) amongst the Jakun in Pahang, followed by Yusof et al. (2007) with 55.1% from the Jahai and Temiar in Perak state and Chua et al. (2017) in Pahang with 53.3%. Another study by Ali, Shamsuddin & Khalid (1991) among the Temuan tribe shows a 32.6% smoking prevalence rate. The study by Ngui et al. (2011) involved six Orang Asli tribe across Malaysia showed a 32.5% smoking prevalence rate. Othman et al. (2012) found a prevalence of 29.4% among the Semai. In a study by Ahmad et al. (2018), the prevalence rate was 27.8%. However, this study did not state the Orang Asli tribe that participated in this study.

Table 4.3: Prevalence of Smoking Behaviour in Included Studies

No.	Author, years	Exposure definition	Tribe			Prevalence	
			Senoi	Proto-Malay	Negrito	Frequency	%
1	Ali, Shamsuddin & Khalid (1991)	Current smoker	X	√	√	14/43	32.6
2	Yusof et al. (2007)	Current smoker	√	X	√	76/138	55.1
3	Ngui et al. (2011)	Current smoker	√	√	X	54/166	32.5
4	Othman et al. (2012)	Current smoker	√	X	X	10/34	29.4
5	Chua et al. (2017)	Current smoker	X	√	X	257/482	53.3
6	Ahmad et al. (2018)	Current cigarette smoker	NR	NR	NR	37/133	27.8
7	Wong et al. (2018)	Current smoker	√	X	√	41/72	56.9

Abbreviations: NR, Not reported

4.2.1.5 Prevalence of Alcohol Consumption

Table 4.4 shown the prevalence of alcohol consumption in the Orang Asli study. A total of six studies reported the prevalence of alcohol use among the Orang Asli with difference exposure definition used across studies. The prevalence of alcohol use ranged from 0 % to 34.8 % with weighted prevalence mean of 22.7%.

Ali, Shamsuddin & Khalid (1991) defined it as alcohol consumption during festivals or after a good harvest season. In this study, among the Temuan tribe, the prevalence of alcohol use was 30.2%. The highest prevalence was 34.8% in the survey conducted by Yusof et al. (2007) among the Jahai and Temiar tribes in Perak. Chua et al. (2017) reported 22.6% of adults Orang Asli consumed alcohol in the past one month of the data collection. Another study by Wong et al. (2018) conducted among the Jakun tribe showed a 15.3% of alcohol use. Ahmad et al. (2013a) reported that 10.1% of the Orang Asli occasionally or frequently consumed alcohol. In a study by Cheng et al. (2014) none of the 13 participating Orang Asli from the Lanoh tribe in Perak state claimed that they consumed alcoholic beverages during the interview.

Table 4.4: Prevalence of Alcohol Consumption in Included Studies

No.	Author, years	Exposure definition	Tribe			Prevalence	
			Senoi	Proto-Malay	Negrito	Frequency	%
1	Ali, Shamsuddin & Khalid (1991)	Alcohol consumption during festivals or after a good harvest season	X	√	√	14/43	30.2
2	Yusof et al. (2007)	Consumed alcoholic drinks	√	X	√	48/138	34.8
3	Ahmad et al. (2013a)	Occasionally or frequent consume alcohol drinks	√	√	√	10/99	10.1
4	Cheng et al. (2014)	Consumed alcoholic drinks	X	X	√	0/13	0
5	Chua et al. (2017)	Consumed alcohol in the past 1 month	X	√	X	109/482	22.6
6	Wong et al. (2018)	Alcohol consumption (any amount and frequency)	X	√	X	11/72	15.3

4.2.1.6 Prevalence of Physical Inactivity

We identified five studies that reported the prevalence of physical inactivity among Orang Asli as shown in Table 4.5. All five studies employed different instruments in assessing the levels of physical activity among respondents.

Furthermore, none of the studies used similar tools as the Malaysia NHMS (IPH, 2015a).

The highest prevalence physical inactivity was 50.0% in Othman (2012), followed by 48.3% in Poh et al. (2010). In an earlier study by Ali, Shamsuddin & Khalid (1991), the prevalence of light intensity daily activity among Orang Asli was 25.6%. In a recent study by Wong et al. (2018), the reported physical inactivity was defined as less than 150 min per week of exercise and the prevalence was 26.4%. In another study by Pell et al. (2016) in Johor, the Orang Asli respondents were categorised into four age groups. The age group of 21 to 25years old was the least active (33.3%), followed by 16 to 20 years old (32.1%) and 26 to 30 years old (18.8%).

Table 4.5: Prevalence of Physically Inactive in Included Studies

No.	Author, years	Exposure definition	Tribe			Prevalence	
			Senoi	Proto-Malay	Negrito	Frequency	%
1	Ali, Shamsuddin & Khalid (1991)	Self-assessment light intensity of daily activities	X	√	√	11/43	25.6
2	Poh et al. (2010)	Sedentary PAL 1.40 – 1.69 =Total energy expenditure /Basal metabolic rate	NR	NR	NR	14/29	48.3
3	Othman et al. (2012)	No regular exercise	√	X	X	17/34	50.0
4	Pell et al. (2016)	Inactive with <600 Metabolic Equivalent of Tasks (METs) per week	NR	NR	NR	NR	16-20y.o:32.0 21-25y.o:33.3 26-30y.o:18.8 31-35y.o:15.8
5	Wong et al. (2018)	Physical not active (<150 min/week exercise)	X	√	X	19/72	26.4

Abbreviation: NR, Not reported; PAL. Physical activity level; y.o, years old

4.2.1.7 Prevalence of Inadequate Fibre Intake and Unhealthy Diet

In this review, only four studies reported on the prevalence of unhealthy diet. Three studies reported the prevalence of inadequate fibre intake whereas one study

reported the prevalence of unhealthy diet among the Orang Asli as shown in Table 4.6. However, the operational definitions used were different and not standardised across the studies. In addition, none of the studies used similar tools as the Malaysia NHMS (IPH, 2015a).

Ali, Shamsuddin & Khalid (1991) reported a low prevalence of fruit consumption among the Temuan in Selangor whereby 96.0% of them did not consume fruits daily and 20.0% did not consume vegetables daily. In a study by Ahmad et al. (2013a), the frequency of fibre intake was measured using the 3-point Likert scale (never, occasionally, or frequent). As high as 47.5% of them reported never or only occasionally eat vegetables whereas 64.3% answered that they never or only occasionally eat fruits. In a study by Wong et al. (2018) reported that among the Jakun in Pahang, the prevalence of inadequate fibre intake was 22.2%. In another study by Rohin et al. (2018) that followed the definition of the Malaysian Dietary Guidelines (NCCFN, 2010) with 27.6%, 19.0%, and 16.0% of the Orang Asli exceeded the daily recommendation of daily carbohydrates, protein, and fat intakes.

Table 4.6: Prevalence of Unhealthy Diet Behaviour in Included Studies

No.	Author, years	Exposure definition	Tribe			Prevalence	
			Senoi	Proto-Malay	Negrito	Frequency	%
1	Ali, Shamsuddin & Khalid (1991)	a) Not consume adequate vegetables (<1/daily)	X	√	√	5/25	20.0
		b) Not consume adequate fruits (<1/daily)				24/25	96.0
2	Ahmad et al. (2013a)	a) Never or occasionally eat vegetables	√	√	√	48/101	47.5
		b) Never or occasionally eat fruits				65/101	64.3
3	Wong et al. (2018)	Fibre intake (fruit & vegetable less than 4/7 per week)	X	√	X	16/72	22.2
4	Rohin et al. (2018)	Exceed normal Malaysia Dietary Guidelines value % of energy	√	X	X		
		a) Carbohydrate (>60%)				16/58	27.6
		b) Protein (>20%)				11/58	19.0
		c) Fat (>35%)				9/58	16.0

4.2.2 Metabolic Risk Factors of NCDs

4.2.2.1 Study Selection

Similarly with behavioural risks of NCDs, from personal communication with the Institute for Public Health Malaysia, no data for metabolic risks of NCDs were available specifically for the Orang Asli categories. The letter of their reply is shown in Appendix 15.

The search was performed on the 13th of September 2019. As shown in Figure 4.4, 160 articles were initially identified using the keywords while another ten additional records were found through other sources. After duplicate records were removed, 167 records were screened based on the inclusion and exclusion criteria. Sixteen articles were finally chosen to be reviewed and summarised.

The earliest study was published in 2007 (1 citation), followed by 2008 (1 citation), 2010 (2 citation), 2013 (1 citation), 2015 (1 citation), 2016 (3 citation), 2017 (1 citation), 2018 (4 citation), and the latest publication in 2019 (1 citations). The publication trend is shown in Figure 4.5. The earliest years of the study being conducted was 2002 and the study was subsequently published in 2007. The last years of research being done was in 2015. Out of the sixteen citations, ten citations did not report the years the study was conducted (Figure 4.5).

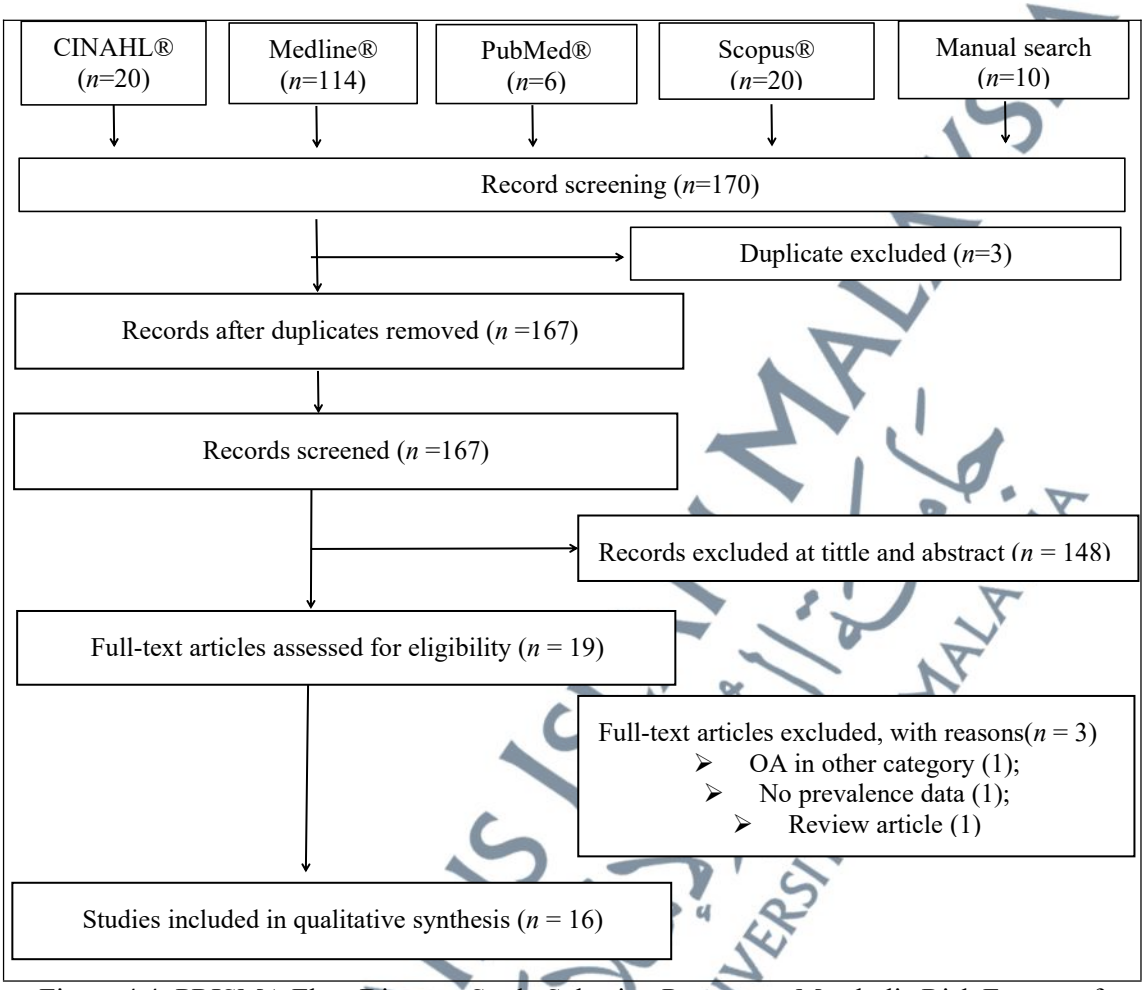

Figure 4.4: PRISMA Flow Diagram Study Selection Process on Metabolic Risk Factors of NCDs

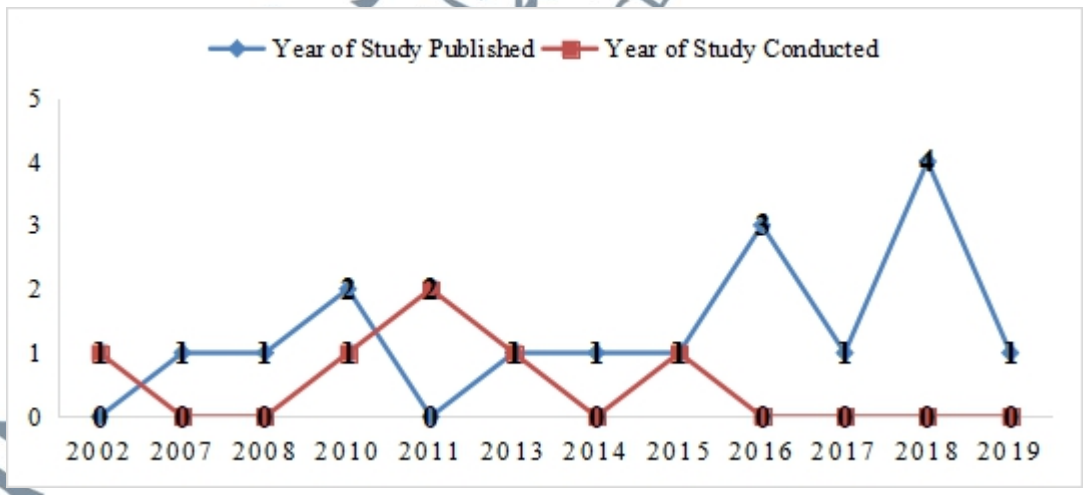

Figure 4.5: Publication Trend studies on Metabolic Risk Factors for NCDs by Years and Count

4.2.2.2 Study Characteristic

The characteristics of each study are provided in Table 4.7. All the studies were observational cross-sectional studies. The sample size ranged from 13 to 636 adults with a minimum age of 16 years old. All the studies involved both genders excepts for study by Mohamud & Suraiami (2010) that only involved females gender. From thirteen studies that reported the number of respondents based on gender, eleven (84.6%) studies had higher numbers of female respondents.

Table 4.7: Characteristics of Metabolic Risk Factors of NCDs Studies

Author, years	**Period**	**Study design**	**Respondents and Setting**			
			n	**State**	**Age,mean (*SD*)**	**Tribe**
Yusof et al. (2007)	2002	Cross-sectional	138 M:35.5% F:64.5%	Perak	16-70, 29.2 (12)	Jahai, Temiar
Adrian Jinam, et al. (2008)	NR	Cross-sectional	129 M:41.5% F: 58.5%	Negeri Sembilan, Perak, Kedah	20 above,	Temuan, Jahai, Kensui
Haemamalar, Zalilah & Neng Azhanie (2010)	NR	Cross-sectional	57 M:50.9% F:49.1%	Pahang	18 above, 36.84 (16.75)	Che Wong
Mohamud & Suraiami (2010)	NR	Cross-sectional	119 F:100%	Selangor	18 above	Temuan
Azuwani et al. (2013)	NR	Cross-sectional	138 M:40.6% F: 59.4%	Perak	18 above	Semai
Cheng et al. (2014)	2011	Cross-sectional	13 M:61.5% F:38.5%	Perak	18-69	Lanoh
Phipps et al. (2015)	NR	Cross-sectional	636 M:43.2% F:56.8%	Pahang, Johor, Selangor, Perak, Kelantan	18 above	Seletar, Jakun, Mahmeri, Semai, Jehai, Mendriq, Batek
Ali et al. (2016)	NR	Cross-sectional	135 M:30.4% F:69.6%	Perak	18 above, 36.7 (14.7)	Semai, Temiar
Ashari et al. (2016)	2011-2013	Cross-sectional	159 M:36.5% F:63.5%	Johor, Perak, Kedah	18 above	Kensiu, Kintak, Lanoh, Mendriq, Che Wong, Orang Kanaq, Orang Seletar

Table 4.7, continued

Author, years	Period	Study design	Respondents and Setting			
			n	State	Age,mean (*SD*)	Tribe
Tuan Abdul Aziz et al. (2016)	NR	Cross-sectional	85 M:38.5% F:61.5%	Pahang, Kelantan, Perak, Kedah, Johor	18 above	Kanaq, Kensiu, Che Wong, Semai, Bateq, Lanoh
Chua et al. (2017)	NR	Cross-sectional	482 M:46.3% F:53.7%	Pahang	18 above, 35.4	Jah Hut, Temuan, Che Wong
Aghakhanian et al. (2018)	2010-2016	Cross-sectional	629 M:NR F:NR	Pahang, Johor Selangor, Perak, Kelantan	18 above	Bateq, Jehai, Mendriq, Kintak,Jakun, Kanak, Seletar, Mahmeri, Semai, Temiar
Ahmad et al. (2018)	2013	Cross-sectional	133 M:33.9% F:66.1%	Perak	18 above 35.5	Semai, Temiar
Mokhsin et al. (2018)	NR	Cross-sectional	150 M:NR F:NR	Kelantan	18 above	Bateq, Mendriq
Wong et al.(2018)	2015	Cross-sectional	72 M:38.9% F:61.6%	Pahang	18 above	Jakun
Zahary et al. (2019)	NR	Cross-sectional	123 M:30.0% F:70.0%	Kelantan	18 above	Temiar

Abbreviations: M, Male; F, Female; NR, Not reported; *SD*, Standard deviation

The number of studies conducted among the three main tribes of Orang Asli is shown in Figure 4.6. The highest number of tribes in the studies was Negrito, followed by Senoi, and Proto-Malay. None of the studies were conducted among the Semoq Beri from the Senoi tribe or the Semelai and Orang Kuala from the Proto-Malay tribe. For the studies on metabolic risk factors of NCDs, six of the studies had specifically aimed to determine the prevalence of metabolic syndrome. As for the other six studies, the risk factors were reported as part of the study variables when assessing NCDs risk such as anthropometric indices (Yusof et al., 2007), obesity (Chua et al., 2017) and coronary risk biomarkers (Mokhsin et al., 2018).

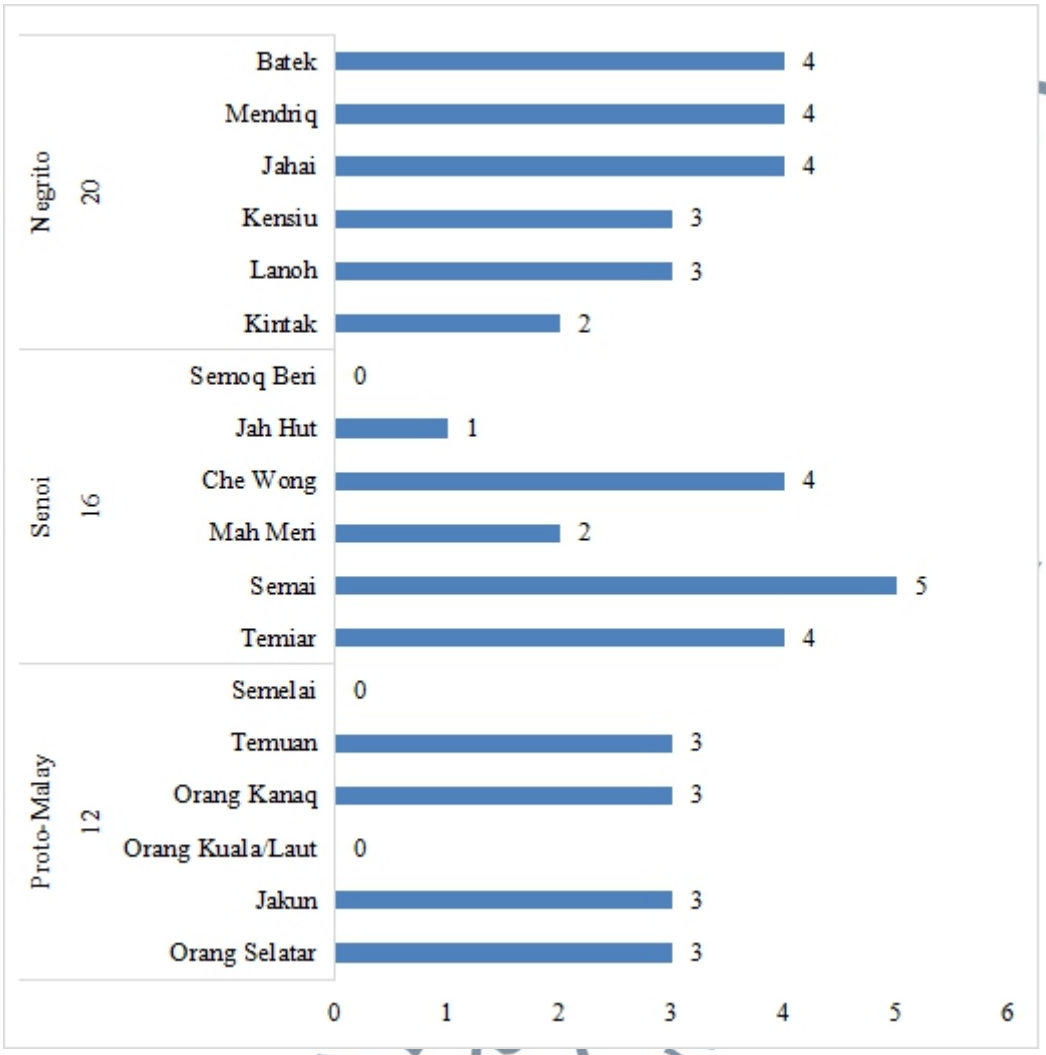

Figure 4.6: Number of Studies for Metabolic Risk Factors of NCDs among Orang Asli tribe

4.2.2.3 Risk of Bias within Studies

Table 4.8 provides a detailed description of the methodological quality of the studies of metabolic risk factors of NCDs. All the studies (100%) had a quality score of more than five. The confounding factors were controlled in all the included studies. Standardised tools were used by all to measure anthropometric and biochemical data. Nevertheless, the measurement tool used across studies were differ thus making the comparison across the studies was limited. In addition, the statistical test used to analyse the data was appropriate and clearly described in all the included studies.

Table 4.8: Quality Assessed for Metabolic Risk factors of NCDs Studies

References	Selection (5)				Comparable (2)	Outcome (3)		Total (10)
	Representativeness of the sample	Sample size	Non-respondents	Risk factor ascertainment	Confounding factors	Outcome assessment	Statistical test	
Yusof et al. (2007)	Somewhat representative *	Not justified	No description	Tool is available or described*	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	5
Adrian Jinam, et al. (2008)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	8
Haemamalar, Zalilah & Neng Azhanie (2010)	Somewhat representative *	Not justified	No description	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	7
Mohamud & Suraiami (2010)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment**	Clearly described and appropriate *	8
Azuwani et al. (2013)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	8
Cheng et al. (2014)	No description	Not justified	No description	Tool is available or described*	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	5
Phipps et al. (2015)	Somewhat representative *	Justified and satisfactory*	No description	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment**	Clearly described and appropriate *	8
Ali et al. (2016)	Somewhat representative *	Justified and satisfactory*	No description	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment**	Clearly described and appropriate *	8

Table 4.8, continued

References	Selection (5)				Comparable (2)	Outcome (3)		Total (10)
	Representativeness of the sample	Sample size	Non-respondents	Risk factor ascertainment	Confounding factors	Outcome assessment	Statistical test	
Ashari et al. (2016)	Somewhat representative *	Justified and satisfactory*	No description	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment. **	Clearly described and appropriate *	8
Tuan Abdul Aziz et al. (2016)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	8
Chua et al. (2017)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment**	Clearly described and appropriate *	8
Aghakhanian et al. (2018)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	8
Ahmad et al. (2018)	Selected group	Justified and satisfactory*	No description	Tool is available or described*	Control for any additional factor *	Independent blind assessment**	Clearly described and appropriate *	6
Mokhsin et al. (2018)	Somewhat representative *	Justified and satisfactory*	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment**	Clearly described and appropriate *	9
Wong et al. (2018)	Somewhat representative *	Justified and satisfactory *	Comparable and response rate is satisfactory *	Tool is available or described*	Controls most important factor. *	Independent blind assessment**	Clearly described and appropriate *	8
Zahary et al. (2019)	Somewhat representative *	Not justified	Comparable and response rate is satisfactory *	Validated measurement tool. **	Control for any additional factor *	Independent blind assessment **	Clearly described and appropriate *	8

4.2.2.4 Prevalence of Abdominal Obesity

The prevalence of abdominal obesity of the twelve studies is shown in Table 4.9. Nine studies were conducted among the Senois, another six on the Proto-Malays, and five on the Negritos. The reported prevalence ranged from 0.8% to 37.0%. The weighted mean prevalence was 24.6%. This is lower compared with the prevalence of abdominal obesity among the Malaysian population with 48.6% (IPH, 2015b). Nevertheless, two studies (Yusof et al., 2007; Azuwani et al., 2013) used higher cut-off values i.e. 102cm for males and 88cm for females for abdominal obesity categorisation than IPH, 2015b. The other ten studies used cut-off values of 90cm for males and 80cm for females.

Table 4.9: Prevalence of Abdominal Obesity in Included Studies

Author, years	Cut-points value	Tribe			Prevalence	
		Senoi	Proto-Malay	Negrito	*n*	%
Yusof et al. (2007)	M≧102 cm F≧88cm	√	X	√	11/ 138	8.0
Haemamalar, Zalilah & Neng Azhanie (2010)	M≧90 cm F≧80cm	√	X	X	6/ 57	10.5
Mohamud & Suraiami (2010)	M≧90 cm F≧80cm	X	√	X	23/ 119	19.6
Azuwani et al.(2013)	F≧80cm	√	X	X	18/ 138	13.0
Phipps et al. (2015)	M≧102 cm F≧88cm	√	√	√	221/ 636	34.8
Ali et al. (2016)	M≧90 cm F≧80cm	√	X	X	50/ 135	37.0
Ashari et al. (2016)	M≧90 cm F≧80cm	√	√	√	47/ 159	29.6
Chua et al. (2017)	M≧90 cm F≧80cm	√	√	X	108/ 482	22.4
Aghakhanian et al. (2018)	M≧90 cm F≧80cm	√	√	√	135/ 629	21.5
Ahmad et al. (2018)	M≧90 cm F≧80cm	√	X	X	36/ 133	26.9
Mokhsin et al. (2018)	M≧90 cm F≧80cm	X	X	√	21/ 150	14.0
Wong et al. (2018)	M≧90 cm F≧80cm	X	√	X	24/ 72	33.3

Abbreviation: M, Male; F, Female

4.2.2.5 Prevalence of Raised Blood Pressure

The weighted mean prevalence of raised BP was found to be 32.2%, ranging from 21.8% to 73.6% in the eleven studies (Table 4.10). In four of the studies, the cut-off value for systolic BP was 130 mmHg or more and 85 mmHg or more for diastolic BP (Ali et al., 2016; Ashari et al., 2016; Aghakhanian et al., 2018; Ahmad et al., 2018). Another six studies used a cut-off value of 140 mmHg and 90 mmHg or more (Adrian Jinam et al., 2008; Cheng et al., 2014; Phipps et al., 2015; Chua et al., 2017; Mokhsin et al., 2018; Wong et al., 2018). One study did not specify the cut-point values used to define raised blood pressure (Azuwani et al., 2013).

Table 4.10: Prevalence of High Blood Pressure in Included Studies

Author, years	Cut-points value	Tribe			Prevalence	
		Senoi	Proto-Malay	Negrito	*n*	%
Adrian Jinam et al. (2008)	BP≥140/90mmHg	X	√	√	64/129	49.6
Azuwani et al. (2013)	None stated	√	X	X	58/138	42.0
Cheng et al. (2014)	BP≥140/90mmHg	X	X	√	15/45	33.3
Phipps et al. (2015)	BP≥140/90mmHg	√	√	√	188/636	29.6
Ali et al. (2016)	BP≥130/85mmHg	√	X	X	47/135	34.8
Ashari et al. (2016)	BP≥130/85 mmHg	√	√	√	50/159	31.4
Chua et al. (2017)	BP≥140/90mmHg or on treatment	√	√	X	123/482	25.5
Aghakhanian et al. (2018)	BP≥130/85mmHg or on treatment	√	√	√	137/629	21.8
Ahmad et al. (2018)	BP≥130/85mmHg	√	X	X	52/133	39.4
Mokhsin et al. (2018)	BP≥130/85 mmHg	X	X	√	86/150	57.2
Wong et al. (2018)	BP≥140/90 mmHg	X	√	X	53/72	73.6

Abbreviation: BP, Blood pressure

4.2.2.6 Prevalence of Hyperglysemia

Ten studies mentioned the prevalence of high blood glucose or hyperglycaemia among the Orang Asli population (Table 4.11). In these ten studies, the weighted mean prevalence was 13.9%, with the reported prevalence rates ranging from 1.5% to 34.8%. Further analysis of the data of each Orang Asli main tribe showed that the prevalence of high blood glucose was higher among the Proto-Malays (Mohamud & Suraiami 2010; Wong et al., 2018) than the Senois (Ahmad et al., 2018) and Negrito (Mokhsin et al., 2018). Even in the studies by Mohamud & Suraiami (2010), 34.8% of the respondent from Proto-Malays group had hyperglycaemia.

Table 4.11: Prevalence of Hyperglycaemia in Included Studies

Author, years	Cut-points value	Tribe			Prevalence	
		Senoi	Proto-Malay	Negrito	*n*	%
Mohamud & Suraiami (2010)	FBG ≥5.6 mmol/L	X	√	X	41/ 119	34.8
Cheng et al. (2014)	FBG ≥7.0 mmol/L	X	X	√	1/25	4.0
Phipps et al. (2015)	FBG ≥6.1mmol/L	√	√	√	47/ 636	7.4
Ali et al. (2016)	FBG ≥5.6 mmol/L or on treatment	√	X	X	6/ 135	4.4
Ashari et al. (2016)	FBG ≥5.6 mmol/L	√	√	√	29/ 159	18.4
Tuan Abdul Aziz et al. (2016)	FBG ≥6.1mmol/L	√	√	√	22/ 85	25.9
Aghakhanian et al. (2018)	FBG ≥5.6 mmol/L or on treatment	√	√	√	126/ 629	20.0
Ahmad et al. (2018)	FBG≥5.6 mmol/L or on treatment	√	X	X	5/ 133	3.8
Mokhsin et al. (2018)	FBG ≥5.6 mmol/L	X	X	√	2/ 150	1.5
Wong et al. (2018)	FBG ≥5.6 mmol/L or RBG ≥11.1mmol/L or on treatment	X	√	X	18/ 72	25.0

Abbreviation: FBG, Fasting blood glucose; RBG, Random blood glucose

4.2.2.7 Prevalence of Dyslipidaemia

According to the 2001 National Cholesterol Education Program (NCEP), one of the features of metabolic risk of NCDs is dyslipidemia. It refers to an elevated triglyceride level or diminished high-density lipoprotein (HDL)-cholesterol (Evaluation Expert Panel on Detection, 2001). The prevalence of dyslipidaemia in each study is shown in Table 4.12 and Table 4.13, respectively. The weighted mean prevalence of high triglyceride was 20.8% and 41.0% for the low level of HDL cholesterol. In terms of the different components of metabolic NCDs risks, the component with the highest prevalence was low HDL cholesterol (41.0%), followed by high blood pressure (32.2%), abdominal obesity (24.6%), high triglyceride (20.8%) and hyperglycaemia with 14.0%.

Table 4.12: Prevalence of High Triglyceride in Included Studies

Author, years	Cut-points value	Tribe			Prevalence	
		Senoi	Proto-Malay	Negrito	*n*	%
Mohamud & Suraiami (2010)	TG level ≥1.7mmol/L	X	√	X	12/ 119	9.8
Phipps et al. (2015)	TG level ≥1.7mmol/L	√	√	√	152/ 636	23.9
Ali et al. (2016)	TG level ≥1.7mmol/L or on treatment	√	X	X	30/ 135	22.2
Ashari et al. (2016)	TG level ≥1.7mmol/L	√	√	√	28/ 159	17.6
Tuan Abdul Aziz et al. (2016)	TG level ≥1.7mmol/L	√	√	√	17/ 85	20.0
Aghakhanian et al. (2018)	TG level ≥1.7mmol/L	√	√	√	120/ 629	19.1
Ahmad et al. (2018)	TG level ≥1.7mmol/L	√	X	X	45/ 133	33.7
Wong et al. (2018)	TG level ≥1.7mmol/L	X	√	X	5/ 72	6.9

Abbreviation: TG, triglyceride

Table 4.13: Prevalence of Abnormal HDL-Cholesterol in Included Studies

Author, years	Cut-points value	Tribe			Prevalence	
		Senoi	Proto-Malay	Negrito	*n*	%
Mohamud & Suraiami (2010)	F:<1.29mmol/L	X	√	X	53/119	44.6
Phipps et al. (2015)	M:<1.0mmol/L, F:<1.3mmol/L	√	√	√	291/636	45.8
Ali et al. (2016)	M:<1.03mmol/L, F:<1.29mmol/L or on treatment	√	X	X	117/135	86.7
Ashari et al. (2016)	<1.0mmol/L	√	√	√	93/159	58.5
Tuan Abdul Aziz et al. (2016)	<1.0mmol/L	√	√	√	29/85	34.1
Aghakhanian et al. (2018)	M:<1.0mmol/L, F:<1.3mmol/L	√	√	√	111/629	17.6
Ahmad et al. (2018)	M:<1.0mmol/L, F:<1.3mmol/L or on treatment	√	X	X	83/133	62.5

Abbreviation: M, Male; F, Female

4.2.2.8 Prevalence of Metabolic Syndrome

The six studies included in this section were published from 2016 to 2019 (Table 4.14). Different definitions of metabolic syndrome were used by the studies. Two studies (Ashari et al., 2016; Aghakhanian et al., 2018) used Joint Interim Statement (JIS) of the International Diabetes Federation (IDF) Task Force on Epidemiology and Prevention, 2009 definition as a measure of metabolic syndrome. In contrast, Mohamud & Suraiami (2010) and Mokhsin et al. (2018) used the IDF, 2006 definition. Another study by Ali et al. (2016) and recent study by Zahary et al. (2019) used a modified National Cholesterol Education Program Adult Treatment Panel (NCEP-ATP III), 2005 and 2006 for metabolic syndrome criteria, respectively.

In these studies, the weighted mean for the general prevalence of metabolic syndrome was 25.9%. Two studies that included all the Orang Asli tribes reported prevalence rates of 17.0% (Ashari et al., 2016) and 29.6% (Aghakhanian et al., 2018), respectively. In research by Aghakhanian et al. (2018) comparing the metabolic syndrome across tribe, the prevalence was highest among the Proto-Malays, followed

by the Negritos and Senois. However, among the individual different tribes studies, the prevalence of metabolic syndrome was higher among the Senoi compared to the Proto-Malays and Negrito. Studies among the Senoi tribe showed that the prevalence of metabolic syndrome was 25.2% (Ali et al., 2016) and 39.8% (Zahary et al., 2019). Another study among Negrito by Mokhsin et al. (2018) had a prevalence of 12.0%.

Whereas, the weighted mean for gender-adjusted prevalence was 19.3% and 29.8% for male and female, respectively. The reported prevalence of metabolic syndrome in the study by Ashari et al. (2016) and Aghakhanian et al. (2018) was higher among female compared to male gender. And in a study among female Temuan from Proto-Malays tribe living in Selangor, the reported prevalence rate of metabolic syndrome was high at 22.7 % (Mohamud & Suraiami, 2010).

Table 4.14: Prevalence of Metabolic Syndrome in Included Studies

Author, years	**Cut-points value**	**Prevalence**						**Association***
		All		**Male**		**Female**		
		n	**%**	***n***	**%**	***n***	**%**	
Mohamud & Suraiami (2010)	IDF, 2006	27/ 119	22.7	Nil	-	27/ 119	22.7	-
Ali et al. (2016)	Modified NCEP-ATP III, 2005	34/ 135	25.2	NR	-	NR	-	-
Ashari et al. (2016)	JIS, 2009	27/ 159	17.0	3/ 58	5.2	24/ 101	23.8	χ^2 test: Significantly higher in female than male (p = .002)
Aghakhanian et al. (2018)	JIS, 2009	186/ 629	29.6	79/ 366	21.6	93/ 263	35.3	χ^2 test: Significantly higher in female than male (p < .001)
Mokhsin et al. (2018)	IDF, 2006	18/ 150	12.0	NR	-	NR	-	-
Zahary et al. (2019)	Modified NCEP-ATP III, 2006	49/ 123	39.8	NR	-	NR	-	-
Weighted Prevalence		341/ 1315	25.9	82/ 424	19.3	144/ 483	29.8	-

Abbreviation: χ^2 ,Chi-square test; NR, Not reported

4.2.3 Summary of Findings of the Systematic Review Phase

To the best of our knowledge, this is the first systematic review conducted on the behavioural and metabolic NCDs risk factors among Orang Asli. By using a systematic review research design, its answers the precise question on the prevalence of behavioural and metabolic risk factors of NCDs among the Orang Asli. Previous literature on this topic among the Orang Asli is very minimal. Data from the systematic reviews provide the understanding and methodological gaps of previously conducted studies and also the increasing burden of preventable and modifiable NCDs risks among the adult's Orang Asli. Such information is highly beneficial to future studies among the Orang Asli.

This systematic review phase highlighted several key findings on the prevalence of modifiable behavioural risk factors and metabolic risks of NCDs among adult Orang Asli in Malaysia. Prevalence of smoking among the Orang Asli ranged from 27.8 % to 56.9 %. The prevalence of alcohol use ranged from 0 % to 34.8 %. The reported prevalence of physically inactive ranged from 13.8% to 50.0%. For inadequate fibre, the prevalence ranged from 22.0% to 96%, depending on the operational definition used in measuring the fibre intake. A study reported 27.6%, 19.0%, and 16.0% of the Orang Asli exceeded the daily recommendation of daily carbohydrates, protein, and fat intakes.

With regards to metabolic risks of NCDs, the reported prevalence of abdominal obesity ranged by 0.8% to 37.0%. The prevalence of raised BP found to be ranging from 21.8% to 73.6%. The reported prevalence rates of hyperglycemia ranged from 1.5% to 34.8%. The ranged prevalence of high triglyceride was 6.9% to 33.7% and 17.6% to 86.7% for the low level of HDL cholesterol. Whereas, the prevalence of metabolic syndrome ranged from 17.0% to 39.8%.

4.2.4 Connectivity to Mixed Methods Research

Future research should focus on targeting different subgroups of the Orang Asli tribe since the Orang Asli population is heterogeneous. By understanding the risks group to major NCDs its allow a targeted programs and intervention strategy that suits the need of this vulnerable community. Another critical aspect of NCDs prevention is the health behaviours among the targeted population. Previous studies among Orang Asli reported a low level of knowledge on diseases and their method of prevention, particularly on NCDs. This suggested that more research is urgently needed among the Orang Asli. Finally, there is a knowledge gap in this area regarding Orang Asli risks and health behaviours towards major NCDs that needs to be explored. Therefore, future initiatives, including further study and intervention programmes focusing on the targeted Orang Asli community, can be conducted.

4.3 Quantitative Findings

4.3.1 Response Rate

A total of 335 adults Orang Asli were approached in eleven randomly selected Orang Asli villages in Jelebu, Negeri Sembilan, Malaysia. Of these, a total of 325 adults participated in this study, giving a response rate of 97.0%. The surveyed data was entered into the SPSS version 23. Data cleaning and examination resulted in all 325 respondents included in the analyses. None were excluded due to missing data and incomplete data.

4.3.2 Sociodemographic Characteristics

Table 4.15 describes the sociodemographic characteristics of the study respondents. The mean age of the respondents was 39.94 years, with *SD* of 13.92

(Males: *M* = 44.43, *SD* = 13.65 and females: *M*= 38.12, *SD* = 12.59). Whereas the median age of respondents was 38.00 years (*IQR*= 29-50). The males in this study had a median age of 47.00 years (*IQR* = 35-54), while female had a median age of 36 years (*IQR* = 28-48). More than half of the respondents in lower education group with had no formal education at 32.0% and primary school level education at 24.6%. Only 13.2% completed secondary Form 5 and 4.0% attained tertiary education. The mean and median income was RM 597.82 (*SD* = 448.01) and RM 500 (IQR = 300-800). As high as 66.8% (*n*=217) of the respondents belonged in the hardcore poverty income category with household income less than RM607 per month.

Table 4.15: Sociodemographic Characteristics of Respondents in the Study by Number and Percentages.

Sociodemographic characteristics		**Male (*n*=94)**	**Female (*n*=231)**	**Total (*n*=325)**
Age (years)	18-39	35 (37.2)	141 (61.0)	176 (54.2)
	40-83	59 (62.8)	90 (39.0)	149 (45.8)
Marital status	Never married	13 (13.8)	15 (6.5)	28 (8.6)
	Currently married	79 (84.0)	196 (84.8)	275 (84.6)
	Separated/divorced	1 (1.1)	13 (5.6)	14 (4.3)
	Widow/widower	1 (1.1)	7 (3.0)	8 (2.5)
Highest education	No formal education	31 (33.0)	73 (31.6)	104 (32.0)
	Less than Primary school	25 (26.6)	55 (23.8)	80 (24.6)
	Completed Primary school	10 (10.6)	37 (16.0)	47 (14.5)
	Completed Secondary Form 3	10 (10.6)	28 (12.1)	38 (11.7)
	Completed Secondary Form 5	14 (14.9)	29 (12.6)	43 (13.2)
	Completed Tertiary education	4 (4.3)	9 (3.9)	13 (4.0)
Occupation	Employed	85 (90.4)	100 (43.3)	185 (56.9)
	Unemployed	9 (9.6)	131 (56.7)	140 (43.1)
Employment category	Government	2 (2.4)	6 (6.0)	8 (4.3)
	Private	1 (1.2)	2 (2.0)	3 (1.6)
	Self-employed	82 (96.5)	92 (92.0)	174 (94.1)
Unemployment category	Home-maker	3 (33.3)	124 (94.7)	127 (90.7)
	Unemployed	3 (33.3)	5 (3.8)	8 (5.7)
	Students	1 (11.1)	2 (1.5)	3 (2.1)
	Others	2 (22.2)	0	2 (1.4)
Income Category	Less than RM607	49(52.1)	168 (72.7)	217 (66.8)
	RM 608 and above	45 (47.9)	63 (27.3)	108 (33.2)

Abbreviation: SD=Standard Deviation; RM=Ringgit Malaysia

4.3.3 Major NCDs

Of the 325 respondents, 20.0% of them had at least one diagnosed chronic disease. Among them, 72.3% (n=47/65) did not receive any follow-up treatment. The highest numbers of major NCDs were hypertension, followed by hypercholesterolemia and DM at 14.8%, 5.2% and 4.3%, respectively.

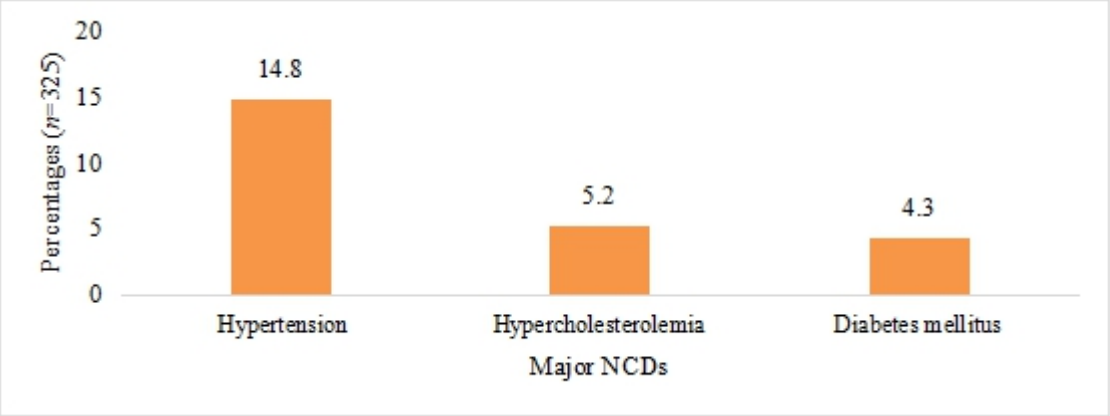

Figure 4.7: Prevalence of Major NCDs

4.3.4 Behavioural Risks of NCDs

The lifestyle behavioural risk factors of NCDs, including tobacco use, alcohol consumption, physical inactivity and insufficiency daily vegetable intake were used to categorise the respondents into those who were considered as being at risk of developing an NCD and those who were not. The percentages of smokers and alcohol drinkers were 28.0% and 7.1% respectively. However, more than half of the respondents were physically inactive (50.5%). In terms of vegetable intake, 53.5% of the respondents did not consume a sufficient intake of three servings of vegetables per day as recommended. The summary for behavioural risks of NCDs is shown in Figure 4.8 below.

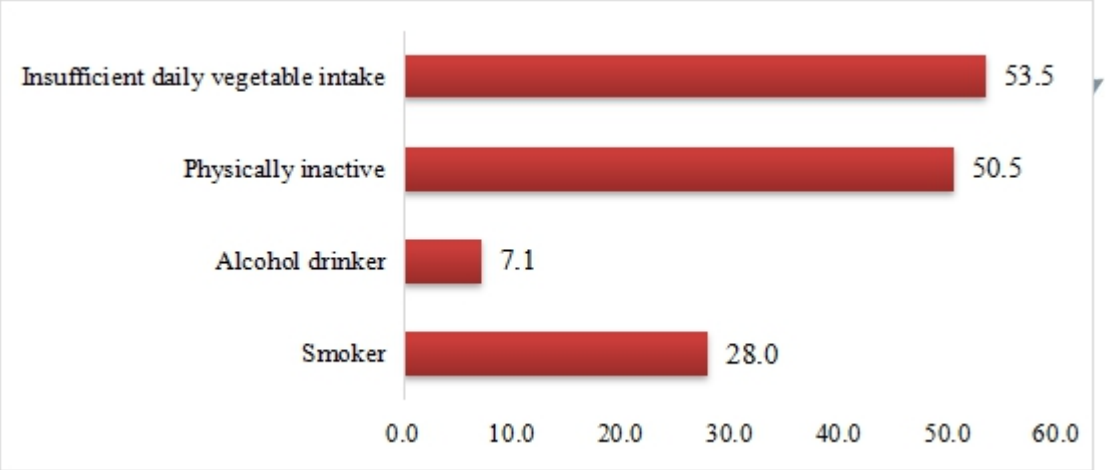

Figure 4.8: Behavioural risk factors of NCDs by Percentage (*n*=325)

4.3.5 Metabolic Risks of NCDs

The summary of respondents with metabolic risks of NCDS of raised blood pressure, increased blood glucose and obesity indicators summarised in Figure 4.9. A proportion of 29.8% (*n*=97) had high BP. Among those diagnosed with hypertension, 60.4% (*n*=29/48) had high blood pressure reading during data collection. 24.5% (*n*=68/277) of those who never diagnosed of having hypertension had raised blood pressure. Meanwhile, among 14 respondents diagnosed with Diabetes mellitus, 35.7% had high blood glucose reading. Among 311 non-diabetic respondents, 4.8% (*n*=13) of them had high glucose level. For obesity indicators, the percentages of respondents with normal, overweight and obese BMI is 26.8%, 13.8% and 59.4%, respectively. Whereas, the percentages of respondents with abdominal obesity and high BFP was 59.7% and 82.2%, respectively.

The sociodemographic characteristic of reported non-hypertensive with raised blood pressure and non-diabetic with increased blood glucose shown in Table 4.16. For raised blood pressure, the majority were among elderly age 40 and above (64.7%), female (57.4%), a lower education level (77.9%) and in the hardcore poverty income

category (64.7%). For increased in blood glucose, more than half were also in the elderly age group (61.5%), female gender (69.2%) and in the hardcore poverty income category (84.6%). All the respondents with unknown Diabetes mellitus and had increased in blood glucose were from the lower education group category (100%).

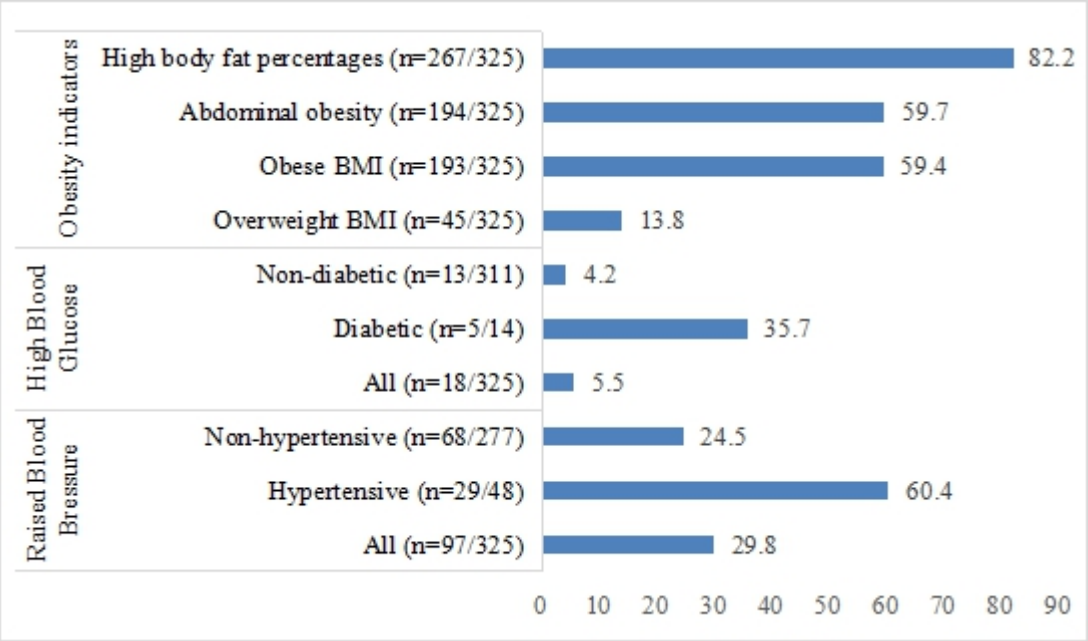

Figure 4.9: Prevalence of Raised Blood Pressure, High Blood Glucose and Obesity Indicators among Respondents by Percentages

Table 4.16: Socio-demographic Characteristics of Unreported NCDs

Sociodemographic characteristics		Raised blood pressure (*n*=68)	Increased blood glucose (*n*=13)
Age (year)	18-39	24 (35.3)	5 (38.5)
	40 and above	44 (64.7)	8 (61.5)
Gender	Male	29 (42.6)	4 (30.8)
	Female	39 (57.4)	9 (69.2)
Education	Less than secondary school	53 (77.9)	13 (100.0)
	Secondary school and above	15 (22.1)	0
Income Category	Less than RM607	44 (64.7)	11 (84.6)
	RM 608 and above	24 (35.3)	2 (15.4)

4.3.6 Knowledge on NCDs

The mean scores for knowledge were 12.82 (*SD* = 9.67). Whereas, the median knowledge scores were 13 (*IQR*= 3-22). Based on 75% and above total score, only

28.0% of the respondents was in good knowledge category (Figure 4.10). The results for individual items in of KAP is shown in the next sections.

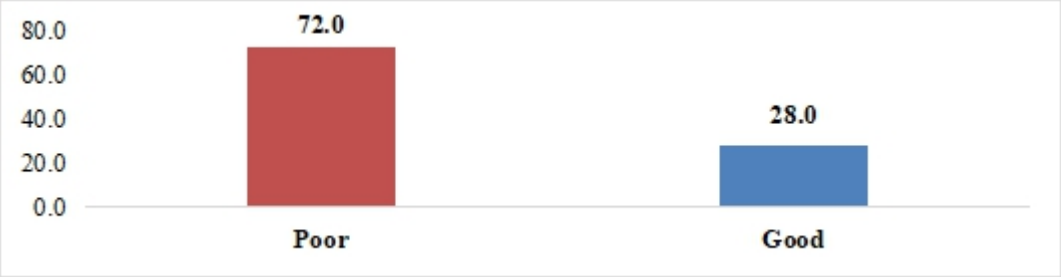

Figure 4.10: Knowledge Category among Respondents (*n*=325)

4.3.6.1 General Knowledge and Examples of NCDs

When respondents were asked about their general knowledge of NCDs, 48.3% (*n*=157) of them had never heard about NCDs. Less than half of the respondents recognised DM (44.6%), asthma (31.7%), and heart disease (41.2%) as NCDs. Furthermore, the majority of responses wrongly indicated that tuberculosis (60.0%), dengue (63.7%), and leptospirosis (65.8%) were examples of NCDs (Figure 4.11). Only 10.8% could correctly categorise all examples of communicable diseases and NCDs.

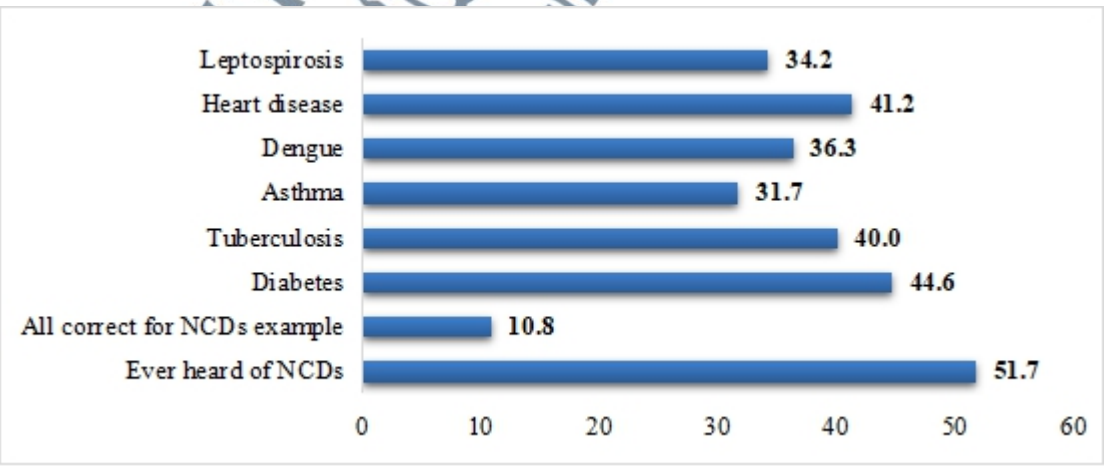

Figure 4.11: General Knowledge of NCDs and its Examples (correct answers only)

4.3.6.2 Knowledge of Heart Attack

More than half of the respondents showed adequate knowledge regarding individual risk factors of heart attack. However, only 36.6% of respondents could answer all the risk factors of heart attack correctly (Figure 4.12).

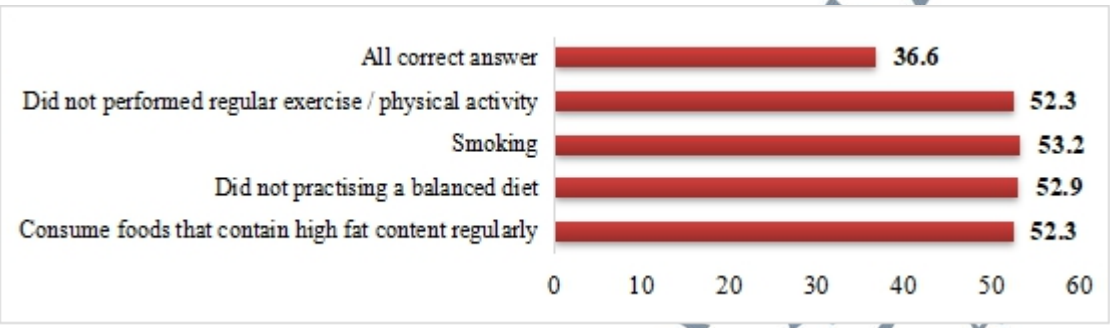

Figure 4.12: Knowledge regarding Heart Attack Risk Factors (correct answer only)

4.3.6.3 Knowledge of Stroke

An overview of the knowledge concerning risk factors of stroke is presented in Figure 4.13. Only one-third of respondents (35.1%) could provide all the correct answers when asked about the risk factors contributing to stroke. More than half (55.7%) knew high blood pressure were the contributing risk factor of stroke. However, less than half knew unbalanced diet, physically inactivity and obesity contribute to stroke with 49.2%, 47.4% and 44.9%, respectively.

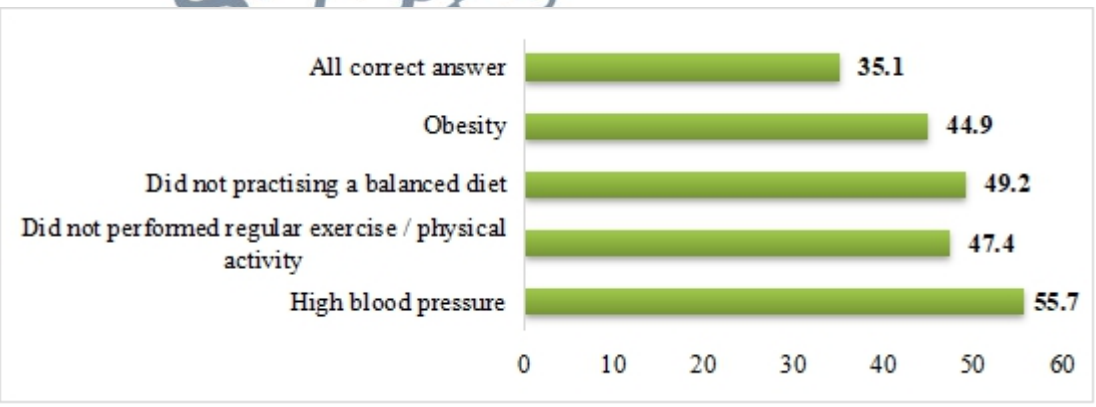

Figure 4.13: Knowledge regarding Stroke (correct answers only)

4.3.6.4 Knowledge of Hypertension

Half of the respondents showed an adequate knowledge regarding the necessary medication (56.6%) and follow-up (54.2) if they were diagnosed with hypertension. However, only 28.0% of respondents could give the correct answer to all the hypertension statements (Figure 4.14).

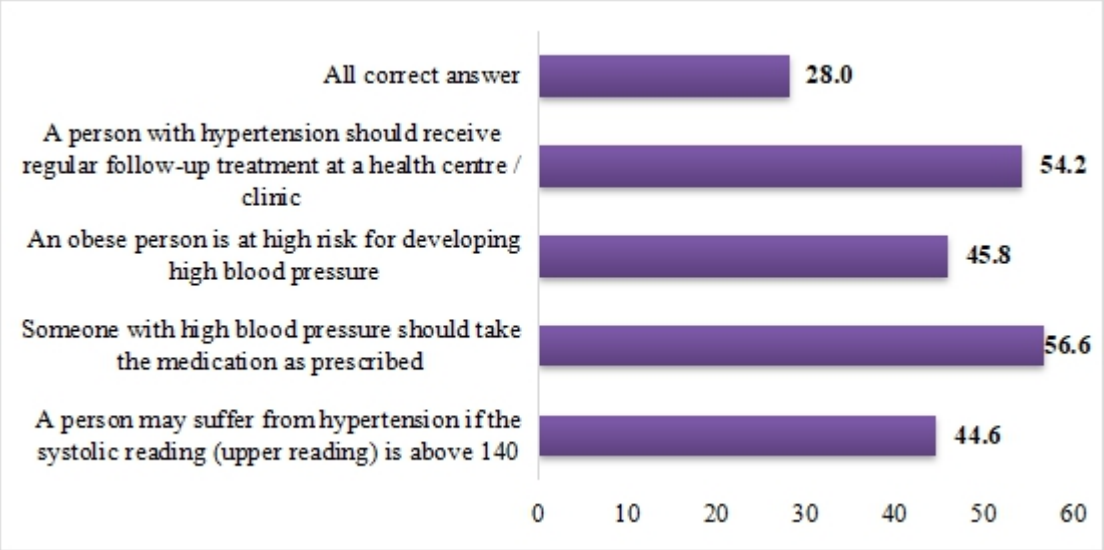

Figure 4.14: Knowledge regarding Hypertension (correct answers only)

4.3.6.5 Knowledge of Diabetes mellitus

More than half (51.4%) of respondents know that excessive starchy food consumption can cause DM. However, less than half (43.7%) known that a family history of DM is a strong risk factor for the disease. Additional to that, only 25.5% of respondents knew that diabetes diseases could cause kidney damage. For the statement on DM, the majority of respondents (83.1%) cannot answer all the statements correctly (Figure 4.15).

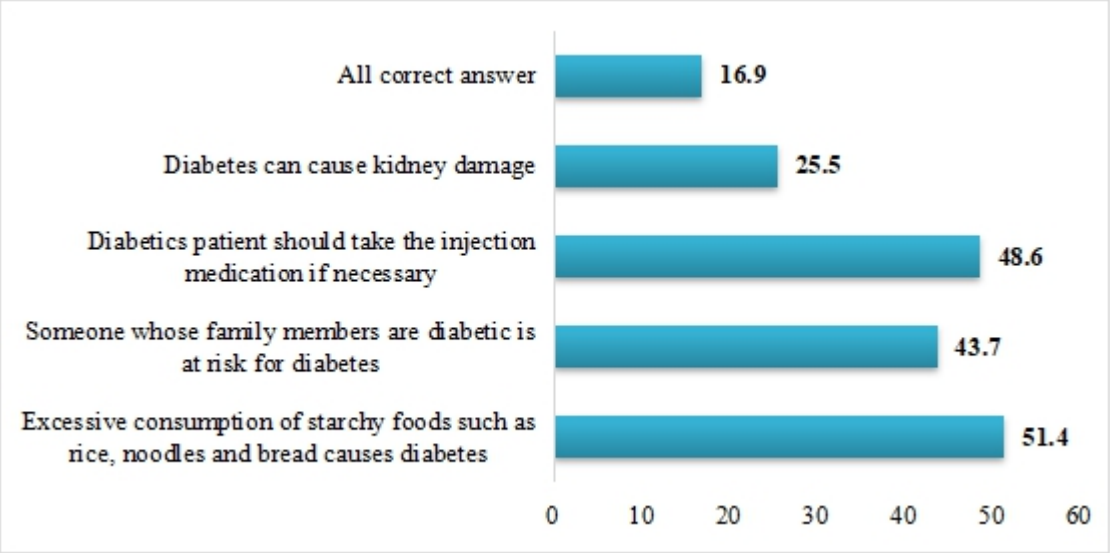

Figure 4.15: Knowledge regarding Diabetes mellitus (correct answers only)

4.3.6.6 Knowledge of COPD

The percentage of respondents with the all correct answer regarding signs and symptoms of chronic obstructive pulmonary diseases (COPD) was 40.6%. Less than half of the respondents managed to give the all correct answer to the signs and symptoms of COPD as shown in Figure 4.16.

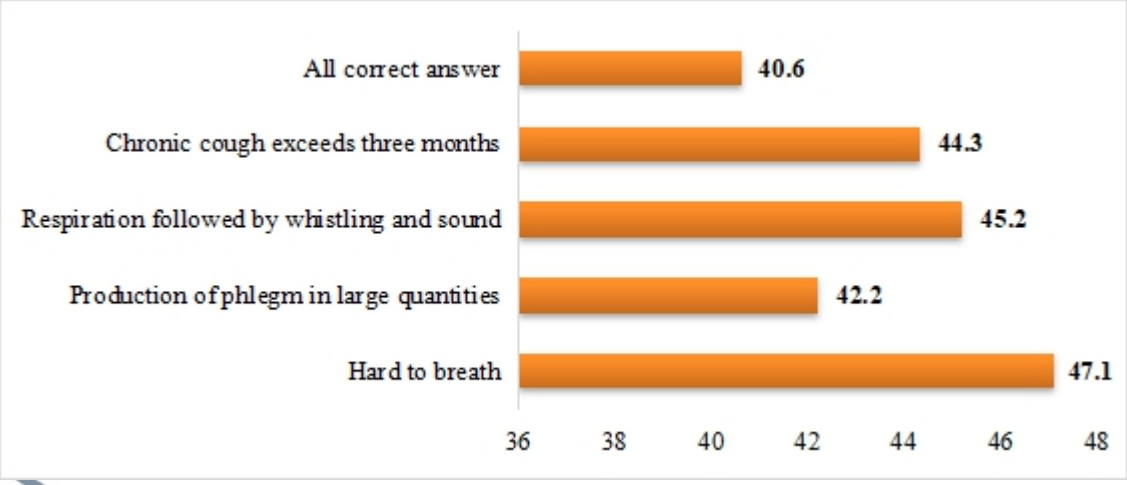

Figure 4.16: Knowledge regarding COPD (correct answers only)

4.3.7 Attitude towards NCDs

The mean scores for attitude were 59.81 (*SD* = 6.24). Whereas, the median knowledge scores were 60 (*IQR*= 56-64). For attitude category (Figure 4.17), slightly more than half of the respondents were in the poor attitude category (51.1%).

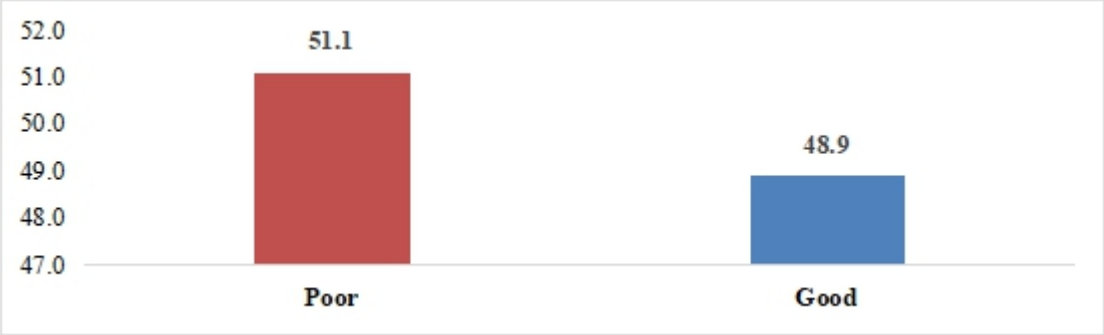

Figure 4.17: Attitude Category among Respondents (*n*=325)

Tables 4.17 shows the attitude of the respondents towards NCDs. Overall, most of the respondents display a positive attitude toward NCDs behavioural risk factors, disease management, and social support.

For attitude towards NCDs behavioural risk factors, the items with the highest proportion of positive attitude were "You feel it is important to practise balanced eating continuously" (93.5%, *n*=304), "You feel it's more important to look after your health" (92.6%, *n*=301), and "If your family members smoke, you will try to advise them to quit smoking" (84.3%, *n*=274). The lowest proportion of positive answers in this section was for the statement of "You need to take food following the calories that you need for your daily activities" (38.2%, *n*=124). For this statement, a high percentage of respondents (46.5%, *n*=151) were unsure about the calorie intake for the daily energy requirement.

Table 4.17: Attitude towards NCDs among Respondents (*n*=325)

Attitude Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
A. **Attitude towards NCDs behavioural risk**					
i. You feel it is important to practise balanced eating continuously	158 (48.6)	146 (44.9)	17 (5.2)	2 (0.6)	2 (0.6)
ii. At your age, periodic physical activity is essential to maintaining your health	64 (19.7)	194 (59.7)	34 (10.5)	21 (6.5)	12 (3.7)
iii. You need to take food following the calories that you need for your daily activities	7 (2.2)	117 (36.0)	151 (46.5)	29 (8.9)	21 (6.5)
iv. In the selection of foods, you will make sure its low in fat	59 (18.2)	178 (54.8)	58 (17.8)	29 (8.9)	1 (0.3)
v. If your family members smoke, you will try to advise them to quit smoking	127 (39.1)	147 (45.2)	35 (10.8)	12 (3.7)	4 (1.2)
vi. You feel it is important to look after your health	169 (52.0)	132 (40.6)	19 (5.8)	5 (1.5)	0
B. **Attitude towards NCDs management**					
i. If you are diagnosed with NCDs, you would try to control the disease before it becomes worse	151 (46.5)	126 (38.8)	18 (5.5)	22 (6.8)	8 (2.5)
ii. You bring along your medicines when visiting relatives who are far away	69 (21.1)	191 (58.8)	33 (10.2)	22 (6.8)	10 (3.1)
iii. When you have diabetes, you will not consume foods that are high in sugar	45 (13.8)	233 (71.7)	29 (8.9)	16 (4.9)	2 (0.6)
iv. Taking the medication/injection provided by your doctor regularly following the prescribed schedule can control diabetes complications	46 (14.2)	124 (38.2)	43 (13.2)	39 (12.0)	73 (22.5)
v. A person with high BP should undergo a BP check during follow-up treatment	53 (16.3)	231 (71.1)	19 (5.8)	21 (6.5)	1 (0.3)
vi. If you have high blood pressure, you will reduce your salt intake	44 (13.5)	225 (69.2)	24 (7.4)	32 (9.8)	0
C. **Attitude towards Support Network**					
i. You will provide financial assistance if your family member has a stroke	142 (43.7)	162 (49.8)	17 (5.2)	4 (1.2)	0
ii. You can take care of your family members if they have a stroke	148 (45.5)	152 (46.8)	16 (4.9)	8 (2.5)	1 (0.3)
iii. You will encourage your female family members to undergo breast cancer screening at the health centre	152 (46.8)	127 (39.1)	38 (11.7)	8 (2.5)	0

As for the attitude towards NCDs management, if they were diagnosed with diseases, the highest proportion of negative attitude was "Taking the medication/injection provided by your doctor regularly based on the prescribed schedule can control diabetes complications" (34.5%, *n*=112). Another 43 of them (13.2%) gave a neutral statement to this statement. Meanwhile, the highest proportion of positive attitude was "A person with high BP should undergo BP check during follow-up treatment" (87.4%, *n*=284) and "If you are diagnosed with NCDs, you would try to control the disease before it becomes worse" (85.2%, *n*=277).

Additionally, in terms of financial and care support, 93.5% and 92.3% of them were willing to help if any of the family members were taken ill due to stroke. For providing support for family members who were going for breast screening statement, 85.9% and 11.7% give a positive and neutral attitude, respectively.

4.3.8 Practice towards Behavioural Risk Factors of NCDs

The mean scores for practice were 6.16 (*SD* = 1.53). Whereas, the median score for practices was 6 with *IQR* 5-7. For practices category, the majority of respondents had (80.6%) poor practice (Figure 4.18).

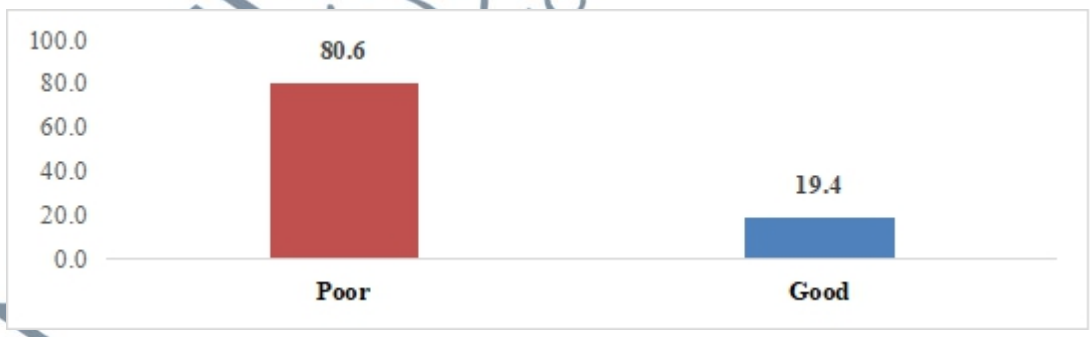

Figure 4.18: Attitude Category among Respondents (*n*=325)

The frequency of adequate practice prevention towards behavioural risks of NCDs is shown in Figure 4.19. The majority of the respondents did not consume alcohol (87.7%) or smoke (72.6%). Less than half of them had a good nutritional habit of taking at least three servings of vegetables per day (46.5%) and performing physical activities more than three times per week (47.7%). Nevertheless, only 9.2% of the respondents measured their body weight weekly.

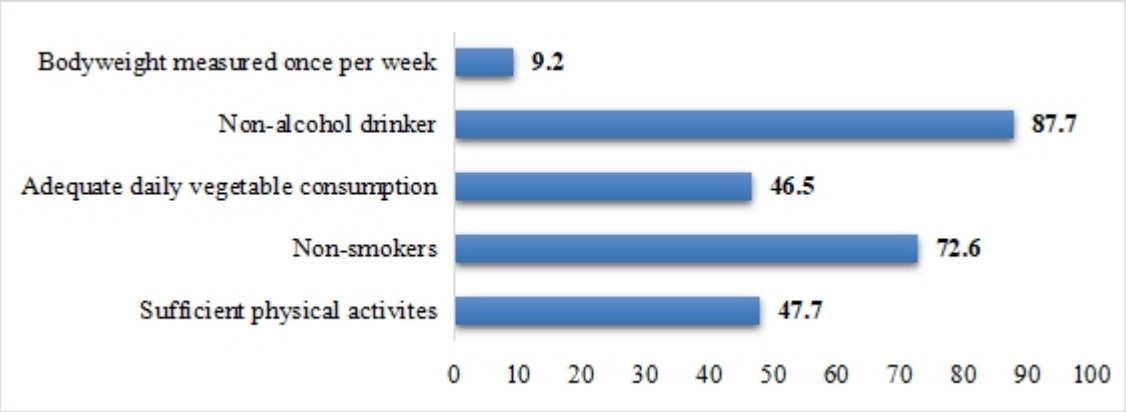

Figure 4.19: Good practice towards NCDs prevention by percentages (*n*=325)

4.3.9 Health-seeking Behaviour

More than half of the respondents 59.3% (*n*=192) sought modern treatments. However, many of them also (40.7%) relied on both traditional and modern treatments. Only one respondent did not seek treatment when sick because he was not bothered about the illness (Figure 4.20). For modern treatment, the majority of the respondents preferred to go to the government clinics, followed by government hospitals, private clinics, and pharmacies (Figure 4.21). For traditional treatment, 58.7% of respondents chose the traditional healer of Orang Asli. In terms of traditional medicine, they relied on massage or hot oil (53.0%) and *air penawar* or treatment (40.9%) given by their traditional healer (Figure 4.22).

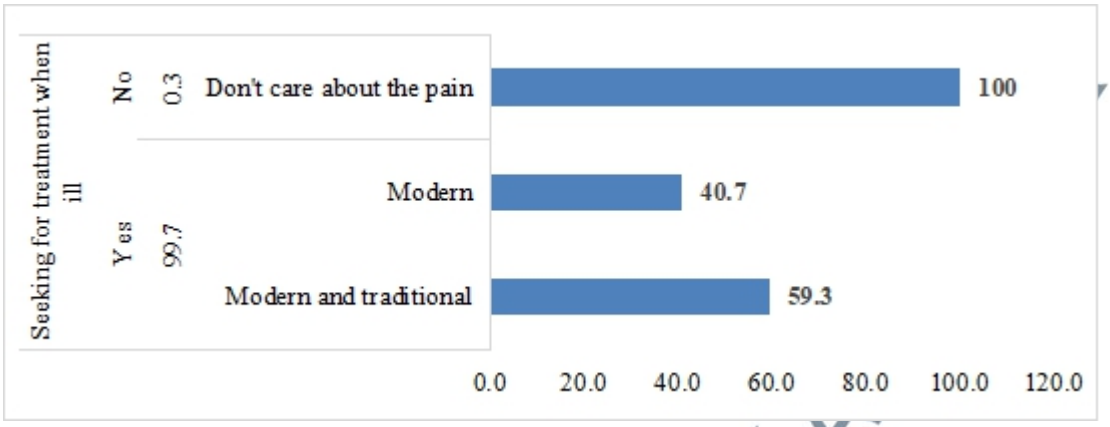

Figure 4.20: Health-seeking behaviours amongst total respondents by percentage (*n*=325)

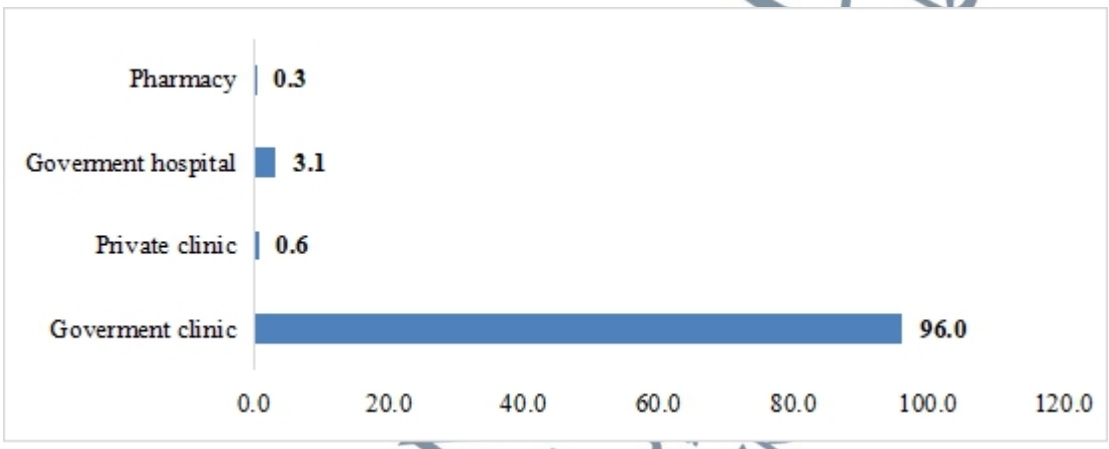

Figure 4.21: Choice of Modern Treatments amongst Respondents by Percentage (*n*=324)

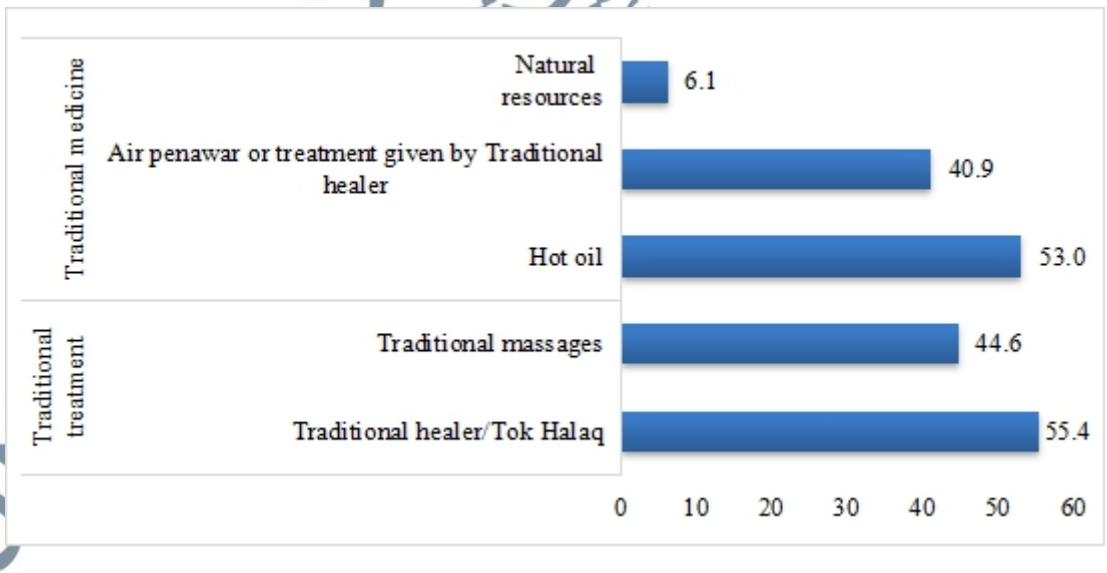

Figure 4.22:Traditional Medicines and Treatments amongst respondents by percentage (*n*=132)

4.3.10 Accessibly to Public Healthcare Facility, Services and Medicine

Table 4.18 shows the accessibly to public healthcare facility, services and medicine by respondents. From the 324 respondents, the majority of them agreed that the facilities were located closed to their homes (83.3%) with suitable operating hours (96.3%). They also had no transportation issues (86.7%). However, 40.1% of the respondents felt that the waiting time at the government healthcare facilities was too long and burdensome.

Table 4.18: Accessibility to government healthcare centres (distance and time) (*n*=324)

Statement	Yes, *n* (%)	No, *n*(%)	Not sure, *n*(%)
i. The distance between home and the government healthcare centre is close	270 (83.3)	53 (16.3)	1 (0.3)
ii. Did not experience any problems in terms of transportation to the government healthcare centre	281 (86.7)	42 (13.0)	1 (0.3)
iii. Operating hours for government healthcare centres are suitable	312 (96.3)	11 (3.4)	1 (0.3)
iv. Waiting time at the government healthcare centre is not burdensome	190 (58.6)	130 (40.1)	4 (1.2)

In terms of accessibility to receive treatment and medicines (Table 4.19), most of the respondents agreed that the accessibility was good. They also felt that the facilities were in good condition (98.5%), with medicines were readily available (99.4%). Furthermore, 99.7% felt comfortable and would continue to seek treatment at the government healthcare centre while 99.1% would recommend family members and friends for treatment at the government healthcare facilities. The modern medicines are more readily available compared to traditional medicines for 93.8% of the respondents. However, 3.4% of respondents feel that traditional medicine is more readily available around their settlements.

Table 4.19: Accessibility to get treatment and medicines at the government healthcare centre (*n*=324)

Statement	Yes, *n* (%)	No, *n*(%)	Not sure, *n*(%)
i. Government healthcare facilities in your area are in good condition	319 (98.5)	5 (1.5)	0
ii. Medicines can be obtained from government health facilities (hospitals / clinics)	322 (99.4)	2 (0.6)	0
iii. Modern medicine is more readily available than traditional medicine	304 (93.8)	11 (3.4)	9 (2.8)
iv. Feel comfortable and will continue to seek treatment at the government healthcare centre	323 (99.7)	1 (0.3)	0
v. Recommend family members and friends for treatment at a government healthcare centre	321 (99.1)	3 (0.9)	0

4.3.11 Correlation between KAP regarding NCDs

The correlation between KAP and NCDs was determine through the Pearson correlation test (Table 4.20). The null hypothesis stated no association between the level of knowledge with attitude and practice score towards NCDs. The analysis of the relationship between knowledge and attitude revealed that knowledge had a significant fair, positive correlation with attitude (r = +0.441; p < .001). Knowledge also had a significant poor correlation with practice towards NCDs (r = +0.153; p = .006). This null hypothesis was therefore rejected.

The null hypothesis stated that there is no association between respondents' attitude towards NCDs and their practice behaviour. The analysis showed that there is a significant poor, positive correlation between attitude and practice regarding NCDs (r = +0.122; p = .028). Therefore, the null hypothesis was rejected.

Table 4.20: Correlations between KAP regarding NCDs using Pearson Correlation Test (*n*=325)

Variables	*r*-value	*p*-value	Interpretation
Knowledge and Attitude	+0.441	<.001*	Fair positive correlation
Knowledge and Practice	+0.153	.006*	Poor positive correlation
Attitude and Practice	+0.122	.028*	Poor positive correlation

Abbreviation: *r*, correlation coefficient; * Significance at p < .05

4.3.12 Univariate and Multivariate Analysis

This section provides the findings for specific objective 3 of the study. The univariate and multivariate analyses were summarised according to conceptual frameworks of the study.

4.3.12.1 Factors Associated with Hypertension

Logistic regression analysis was performed to identify the factors associated with dependent variables hypertension. The independent variables inserted in the model included sociodemographic characteristic (age, gender, education, and hardcore poverty category), behavioural risk factors of NCDs (smoking status, alcohol behaviour, physical inactivity, and insufficient vegetables intake), metabolic risks of NCDs (abdominal obesity, raised blood pressure and increased blood glucose) and health behaviour (knowledge, attitude and practices score).

From the multiple binary logistic regression (Table 4.21), the results indicated that age group and smoking status provided a statistically significant improvement over the constant-only-model [χ^2 (14, N= 325) = 84.659, p< .001]. Those who were older than 40 years old recorded a 18 times of odds of having hypertension compared to those in the younger age group (*aOR* = 18.544; 95% CI 5.879,58.494; p < .001). Smokers had 13.2% lesser odds of having hypertension (*aOR*= 0.132; 95% CI 0.034, 0.503; p = 0.003).

According to the Nagelkerke R^2 value, the variance was 40.4% and the correct prediction rate was about 87.7%. The Hosmer-Lemeshow goodness of fit p-value was more than 0.05 (χ2= 3.499, *df*=8, p = .899), thus the observed and predicted probabilities matched and the model had a good fit. Multicollinearity test was conducted and the analysis showed that multicollinearity was not present as all the

Table 4.21: Factors Associated with Hypertension (using Univariate and Multivariate Logistic Regression)

Variable	Hypertension, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	4 (1.2)	172 (52.9)	Ref					Ref	
≧40	44 (13.5)	105 (32.3)	18.019(6.293,51.592)	47.625	<.001*	2.920	24.822	18.544(5.879,58.494)	<.001*
Gender									
Male	13 (4.0)	81 (24.9)	1.113(0.560,2.212)	0.093	.761	0.111	0.047	1.117(0.408,3.058)	.829
Female	35 (10.8)	196 (60.3)	Ref					Ref	
Education									
Low	43 (13.2)	188 (57.8)	4.071(1.559,10.631)	11.046	.004*	0.873	2.143	2.393 (0744, 7.698)	.143
High	5 (1.5)	89 (27.4)	Ref					Ref	
Hardcore poverty									
Yes	33 (10.2)	184 (56.6)	1.112 (0.575,2.150)	0.100	.752	-0.252	0.309	0.777 (0.319, 1.893)	.579
No	15 (4.6)	93 (28.6)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	6 (1.8)	85 (26.2)	0.323 (0.132, 0.788)	6.711	.010*	-2.029	8.782	0.132 (034, 0.503)	.003*
No	42 (12.9)	192 (59.1)	Ref					Ref	
Alcohol drinker									
Yes	2 (0.6)	21 (6.5)	1.887 (0.428, 8.321)	0.823	.402	0.088	0.008	1.285 (0.207, 7.959)	.788
No	46 (14.2)	256 (78.8)	Ref					Ref	
Physically inactive									
Yes	28 (8.6)	136 (41.8)	1.451 (0.781, 2.699)	1.402	.239	0.452	0.749	1.572 (0.564, 4.376)	.387
No	20 (6.2)	141 (43.4)	Ref					Ref	
Inadequate vegetables intake	25 (7.7)	149 (45.8)	0.934 (0.506, 1.725)	0.048	.827	-0.294	0.372	0.746 (0.290, 1.916)	.542
Yes	23 (7.1)	128 (39.4)	Ref					Ref	
No									

Table 4.21, continued

Variable	Hypertension, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Metabolic Risks									
Abdominal Obesity									
Yes	37 (11.4)	157 (48.3)	2.571 (1.259, 5.249)	7.536	.010*	0.710	2.130	2.033 (0.784, 5.273)	.144
No	11 (3.4)	120 (36.9)	Ref					Ref	
Raised blood pressure									
Yes	29 (60.4)	68 (24.5)	4.691 (2.474, 8.896)	23.010	<.001	0.607	2.178	1.836 (0.819, 4.113)	.140
No	19 (39.6)	209 (75.5)	Ref					Ref	
Increased blood glucose									
Yes	5 (10.4)	13 (4.7)	2.361 (0.801, 6.958)	2.155	.160	0.162	0.060	1.176 (0.323,4.281)	.806
No	43 (89.6)	264 (95.3)	Ref					Ref	
Health Behaviour									
Knowledge score	-	-	0.998 (0.967,1.030)	9.287	.895	-0.006	0.057	0.994 (0.949, 1.042)	.812
Attitude score	-	-	1.013 (0.964, 1.065)	5.466	.613	0.005	0.024	1.005 (0.939, 1.077)	.877
Practices score	-	-	1.037 (0.848, 1.269)	4.611	.722	-0.157	0.451	0.855 (0.541, 1.350)	.502
Constant						-4.029	1.949		.018

Abbreviations: *OR*, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, *Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.404; Hosmer-Lemeshow test=0.899 ($p > .05$); Prediction power 87.7%; Collinearity: Minimum tolerance value 0.326 (>0.1), max VIF 3.068 (<10); Durbin-Watson, d = 1.982 (1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable: Hypertension, Significance at: * $p < .05$

variance inflation factor (VIF) values were less than ten and the tolerance values exceeded 0.1 The Durbin-Watson value, d = 1.982, was between the two critical values of 1.5 to 2.5, thus indicating that the residuals were uncorrelated and the independent error assumption was satisfied.

4.3.12.2 Factors Associated with Hypercholesterolemia

Table 4.22 shows the logistic regression result that examined the factors associated with hypercholesterolemia. The variable of drinking alcohol was excluded from the model since none of the respondents with hypercholesterolemia was a drinker.

The result indicated that age group and knowledge score provided a statistically significant improvement over the constant-only-model [χ^2 (13, N= 325) = 34.318, p < .001]. The odds of the older age group having hypercholesterolemia was five times higher than the younger age group (*aOR* = 5.492; 95% CI 1.255, 24.038; p=.024). There is an increased of 12.8% in knowledge score for those who are having hypercholesterolemia (*aOR* = 1.128; 95% CI 1.040, 1.223; p = .003).

The analysis showed the Nagelkerke R^2 value was 29.8% and the correct prediction rate was about 95.7%. The Hosmer-Lemeshow goodness of fit p-value was more than 0.05 (χ^2=7.017, df=8, p = .535) so the observed and predicted probabilities matched and the model fitted.

Table 4.22: Factor Associated with Hypercholesterolemia (using Univariate and Multivariate Logistic Regression)

Variable	Hypercholesterolemia, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	3 (0.9)	173 (53.2)	Ref					Ref	
≧40	14 (4.3)	135 (41.5)	5.980(1.684, 21.233)	10.178	.006*	1.703	5.112	5.492 (1.255, 24.038)	.024*
Gender									
Male	3 (0.9)	91 (28.0)	0.511 (0.143, 1.821)	1.216	.300	-0.549	0.458	0.577 (0.118, 2.832)	.498
Female	14 (4.3)	217 (66.8)	Ref					Ref	
Education									
Low	15 (4.6)	216 (66.5)	3.194(0.716, 14.251)	3.023	.128	1.047	1.462	2.848 (0.522, 15.531)	.227
High	2 (0.6)	92 (28.3)	Ref					Ref	
Hardcore poverty									
Yes	12 (3.7)	205 (63.1)	1.206 (0.414, 3.515)	0.102	.732	0.558	0.687	1.748 (0.467, 6.548)	.407
No	5 (1.5)	103 (31.7)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	3 (0.9)	88 (27.1)	0.536 (0.150, 1.910)	1.042	.010*	-0.694	0.593	0.499 (0.085, 2.922)	.441
No	14 (4.3)	220 (67.7)	Ref					Ref	
Alcohol drinker									
Yes	0	285 (87.7)	-	-	-	-	-	-	-
No	17 (5.2)	23 (7.1)							
Physically inactive									
Yes	11 (3.4)	153 (47.1)	1.857 (0.670, 5.148)	1.478	.239	-0.594	0.628	0.552 (0.127, 2.397)	.428
No	6 (1.8)	155 (47.7)	Ref					Ref	
Inadequate vegetables intake									
Yes	10 (3.1)	164 (50.5)	1.254 (0.465, 3.381)	0.023	.827	-0.601	0.600	0.548 (0.120, 2.508)	.438
No	7 (2.2)	144 (44.3)	Ref					Ref	

Table 4.22, continued

Variable	Hypercholesterolemia, *n* (%)		Crude OR (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted OR (95% CI)[b]	*p*-value[b]
	Yes	No							
Metabolic Risks									
Abdominal Obesity									
Yes	15 (4.6)	179 (55.1)	5.405(1.215, 24.047)	7.115	.027*	1.181	1.901	3.258 (0.608, 17.458)	.168
No	2 (0.6)	129 (39.7)	Ref					Ref	
Raised blood pressure									
Yes	10 (58.8)	87 (28.2)	3.629 (1.339, 9.837)	6.490	.011*	0.464	0.525	1.590 (0.453, 5.579)	.469
No	7 (41.2)	221 (71.8)	Ref					Ref	
Increased blood glucose									
Yes	2 (11.8)	16 (5.2)	2.433 (0.512, 11.567)	1.039	.308	-0.050	0.003	0.952 (0.166, 5.457)	.956
No	15 (88.2)	292 (94.8)	Ref					Ref	
Health Behaviour									
Knowledge score			1.091 (1.025, 1.162)	9.270	.006*	0.120	8.538	1.128 (1.040, 1.223)	.003*
Attitude score			1.062 (0.976, 1.155)	6.049	.161	-0.140	0.070	0.986 (0.886, 1.097)	.791
Practices score			0.931 (0.676, 1.283)	6.854	.663	-0.187	0.317	0.830 (0.433, 1.589)	.573
Constant						-5.352	1.854		.005

Abbreviations: *OR*, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, * Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.298; Hosmer-Lemeshow test=0.535 ($p > .05$); Prediction power 95.7%; Collinearity: Minimum tolerance value 0.342 (>0.1), max VIF 2.926 (<10); Durbin-Watson, d = 1.921 (1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable: Hypercholesterolemia, * Significance at $p < .05$

4.3.12.3 Factors Associated with Diabetes mellitus

The logistic regression results in Table 4.23 shows factors association with Diabetes mellitus.The results indicated that age group, physical activity status and practices scores provided a statistically significant improvement over the constant-only-model [χ^2 (13, N= 325) = 36.316, $p <$ .001].

The odds of Diabetes mellitus in the older age group was 15 times higher than that of the younger age group (*aOR* = 15.388; 95% CI 2.556, 92.646; p = .003). Those with physically inactive were eleven times more likely to be Diabetes mellitus(*aOR*=11.478; 95% CI 2.023,65.117. p= .006). Those who having Diabetes mellitus had 17 times higher the odds of having increased blood glucose (*aOR* = 17.225; 95% CI 3.235, 91.705; p = .001). Whereas, there is a significant increased in practices score among those with Diabetes mellitus (*aOR* = 2.176; 95% CI 1.054, 4.490; p = .035).

The analysis showed that multicollinearity was not present as all the VIF values were less than ten and the tolerance values exceeded 0.1. The Durbin-Watson value, d=1.903, indicated that the residuals were not correlated and the independent error assumption was satisfied. Therefore, the data met all assumptions for normality. The Nagelkerke R^2 value of 0.354 showed that the full model explained 35.4 % of the variance in the independent variables. The correct prediction rate was about 96.3%. The Hosmer-Lemeshow goodness of fit p-value was more than 0.05 (χ^2= 4.451 df=8, p = .814) so the observed and predicted probabilities matched and the model fitted.

Table 4.23: Factor Associated with Diabetes mellitus (using Univariate and Multivariate Logistic Regression)

Variable	Diabetes mellitus, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	2 (0.6)	174 (53.5)	Ref					Ref	
≧40	12 (3.7)	137 (42.2)	7.620 (1.677,34.620)	10.092	.009*	2.734	8.907	15.388 (2.556, 92.646)	.003*
Gender									
Male	4 (1.2)	90 (27.7)	0.982 (0.300, 3.213)	0.001		0.008	0.000	1.008 (0.182. 5.586)	.993
Female	14 (3.1)	221 (68.0)	Ref		.976			Ref	
Education									
Low	11 (3.4)	220 (67.7)	1.517 (0.413, 5.564)	0.423	.530	-0.324	0.140	0.723 (0.132, 3.957)	.709
High	3 (0.9)	91 (28.0)	Ref					Ref	
Hardcore poverty									
Yes	6 (1.8)	193 (59.4)	0.481 (0.164, 1.408)	1.751	.182	-1.159	2.445	0.314 (0.073, 1.342)	0.118
No	8 (2.5)	118 (36.3)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	3 (0.9)	88 (27.1)	0.691 (0.188, 2.536)	0.330	.578	0.399	0.172	1.490 (0.227, 9.808)	.678
No	11 (3.4)	223 (68.6)	Ref					Ref	
Alcohol drinker									
Yes	0	23 (7.1)	-	-	-	-	-	-	-
No	14 (4.3)	288 (88.6)							
Physically inactive									
Yes	11 (3.4)	153 (47.1)	3.786 (1.036, 13.836)	4.913	.044*	2.440	7.593	11.478 (2.023,65.117)	.006*
No	3 (0.9)	158 (48.6)	Ref					Ref	
Inadequate vegetables intake									
Yes	6 (1.8)	168 (51.7)	0.638 (0.216, 1.883)	0.669	.416	0.093	0.014	1.097 (0.239, 5.032)	.905
No	8 (2.5)	143 (44.0)	Ref					Ref	

Table 4.23, continued

Variable	Diabetes mellitus, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Metabolic Risks									
Abdominal Obesity									
Yes	10 (3.1)	184 (56.6)	1.726 (0.529, 5.623)	0.873	.365	0.024	0.001	1.025 (0.195, 5.390)	.977
No	4 (1.2)	127 (39.1)	Ref					Ref	
Raised blood pressure									
Yes	6 (42.9)	91 (29.3)	1.813 (0.612, 5.373)	1.111	.292	-0.627	0.735	0.534 (0.128,2.238)	.391
No	8 (57.1)	220 (70.7)	Ref					Ref	
Increased blood glucose									
Yes	9 (64.3)	13 (4.2)	12.735(3.737, 43.403)	12.904	<.001*	2.846	11.130	17.225 (3.235, 91.705)	.001*
No	5 (35.7)	298 (95.8)	Ref					Ref	
Health Behaviour									
Knowledge score			1.017 (0.961,1.075)	0.340	.561	-0.008	0.034	0.992 (0.915,1.076)	.855
Attitude score			1.013(0.929,1.105)	0.086	.770	0.019	0.109	1.019 (0.911, 1.140)	.741
Practices score			1.095 (0.769, 1.558)	0.253	.616	0.777	4.422	2.176 (1.054,4.490)	.035*
Constant						-11.912	6.781		<.001

Abbreviations: *OR*, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, * Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.354; Hosmer-Lemeshow test=0.814 ($p > .05$); Prediction power 96.3%; Collinearity: Minimum tolerance value 0.342 (>0.1), max VIF 2.926(<10); Durbin-Watson, d = 1.903 (1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable: Diabetes mellitus, * Significance at $p < .05$

4.3.12.4 Factors Associated with Abdominal Obesity

Table 4.24 shows that gender, income status, and raised blood pressure group provided a statistically significant improvement over the constant-only-model [χ^2 (13, *N*= 325) =89.516, $p < .001$]. Females had seven times higher odds of having abdominal obesity as compared to males (*aOR*=7.243; 95% CI 3.493, 15.018; $p <.001$). Those in the hardcore poverty category had 53.5% less likely to have abdominal obesity (*aOR*=0.535; 95% CI 0.293, 0.977; $p = .042$). Whereas who had raised in blood pressure were five times more likely to be abdominal obesity (*aOR*=5.408; 95% CI 2.261, 11.161; $p < .001$).

Multicollinearity test was performed and showed that multicollinearity was not present because all the VIF values were less than ten and tolerance values exceeded 0.1. The Durbin-Watson value, *d*=1.798, indicated that the residuals were not correlated and the independent error assumption was satisfied. Therefore, the data met all assumptions for normality. The Nagelkerke R^2 value was 32.5% and the correct prediction rate was about 71.1%. The Hosmer-Lemeshow goodness of fit was χ^2= 8.717 *df*=8, *p*=0.367 ($p > .05$) so the observed and predicted probabilities matched and the model fitted.

Table 4.24: Factor Associated with Abdominal Obesity (using Univariate and Multivariate Logistic Regression)

Variable	Abdominal obesity, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	104 (32.0)	72 (22.2)	1.056 (0.677, 1.648)	0.058	.810	0.169	0.292	1.185 (0.641, 2.190)	.589
≧40	90 (27.7)	59 (18.2)	Ref					Ref	
Gender									
Male	32 (9.8)	62 (19.1)	Ref					Ref	
Female	162 (49.8)	69 (21.2)	4.549 (2.728, 7.585)	35.979	<.001*	1.980	28.316	7.243 (3.493, 15.018)	<.001*
Education									
Low	142 (43.7)	89 (27.4)	0.776 (0.487, 1.261)	1.045	.306	0.381	1.483	1.464 (0.793, 2.704)	.223
High	52 (16.0)	42 (12.9)	Ref					Ref	
Hardcore poverty									
Yes	127 (39.1)	90 (27.7)	1.158 (0.721, 1.859)	0.371	.543	-0.626	4.146	0.535 (0.293, 0.977)	.042*
No	67 (20.6)	41 (12.6)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	38 (11.7)	53 (16.3)	2.789 (1.696,4.587)	16.698	<.001*	-0.162	0.138	0.851 (0.362,1.999)	.711
No	156 (48.0)	78 (24.0)	Ref					Ref	
Alcohol drinker									
Yes	5 (1.5)	18 (5.5)	0.166 (0.060, 0.460)	14.843	<.001*	-1.066	2.801	0.344 (0.099, 1.200)	.094
No	189 (58.2)	113 (34.8)	Ref					Ref	
Physically inactive									
Yes	98 (30.2)	66 (20.3)	0.995 (0.638, 1.550)	0.001	.981	-0.305	0.716	0.737(0.364, 1.494)	.398
No	96 (29.5)	65 (20.0)	Ref					Ref	
Inadequate vegetables intake									
Yes	107 (32.9)	67 (20.6)	0.851 (0.546, 1.327)	0.505	.477	0.488	2.289	1.630 (0.866, 3.069)	.130
No	87 (26.8)	64 (19.7)	Ref					Ref	

Table 4.24, continued

Variable	Abdominal Obesity, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Metabolic Risks									
Raised blood pressure									
Yes	75 (38.7)	22 (16.8)	3.123 (1.817, 5.367)	18.754	< .001*	1.688	20.853	5.408 (2.621,11.161)	< .001*
No	119 (61.3)	109 (83.2)	Ref					Ref	
Increased blood glucose									
Yes	16 (8.2)	2 (1.5)	5.798 (1.310,25.657)	7.960	.005	1.339	2.501	3.814 (0.726,20.047)	.114
No	178 (91.8)	129 (98.5)	Ref					Ref	
Health Behaviour									
Knowledge score	-	-	1.027 (1.003, 1.051)	4.962	.027*	0.019	1.257	1.019(0.986,1.053)	.262
Attitude score	-	-	1.034 (0.998, 1.072)	3.366	.068	0.007	0.096	1.008 (0.961,1.056)	.757
Practices score	-	-	1.221 (1.051, 1.419)	7.029	.009*	0.059	0.159	1.061(0.793, 1.418)	.690
Constant						-2.473	1.714		.004

Abbreviations: *OR*, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, * Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.325; Hosmer-Lemeshow test= 0.367 ($p > .05$); Prediction power 71.1%; Collinearity: Minimum tolerance value 0.326(>0.1), max VIF 3.066 (<10); Durbin-Watson, d = 1.798 (1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable : Abdominal obesity category (waist circumference, male >90cm, female >80cm), * Significance at: $p < .05$

4.3.12.5 Factors Associated with Raised Blood Pressure

Table 4.25 presents the results from the final model that investigated the association between raised blood pressure category with sociodemographic characteristics (age, gender, education background, and hardcore poverty group), behavioural and metabolic risks and KAP scores. The results indicated that age group, adequate vegetable consumption and metabolic risk of abdominal obesity and increased blood glucose group provided a statistically significant improvement over the constant-only-model [χ^2 (13, N= 325) =99.668, $p < .001$].

The older age group (40 and above) had six times the odds of having raised blood pressure with *aOR*=6.735 (95% CI 3.526,12.866), $p < .001$. Inadequate vegetables intake group were three times more likely to be in the raised blood pressure category with *aOR* = 3.142 (95% CI 1.527, 6.468, $p < .002$). Abdominal obesity group had five times higher odds of having raised blood pressure category with *aOR* = 5.174 (95% CI 2.495, 10.727), $p < .001$. And those with increased blood glucose had 3 times significantly higher the odds of having raised blood pressure category [*aOR* = 3.139, 95% CI 1.011, 9.740, $p = .048$].

Multicollinearity test was conducted and the analysis showed that multicollinearity was not present with all the VIF values were less than ten and tolerance values exceeded 0.1. The Durbin-Watson value was $d = 2.125$. Therefore, the data met all assumptions for normality. The Nagelkerke R^2 was 37.5% and the correct prediction rate was 80.9%. The Hosmer-Lemeshow goodness of fit *p*-value was more than 0.05 (χ^2= 8.117 *df*=8, $p = .422$) so the observed and predicted probabilities matched and the model fitted.

Table 4.25: Factor Associated with Raised Blood Pressure (using Univariate and Multivariate Logistic Regression)

Variable	Raised Blood Pressure, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	23 (23.7)	153 (67.1)	Ref					Ref	
≧40	74 (76.3)	75 (32.9)	6.563 (3.812, 11.301)	53.196	< .001*	1.907	33.358	6.735(3.526,12.866)	< .001*
Gender									
Male	36 (37.1)	58 (25.4)	Ref					Ref	
Female	61 (62.9)	170 (71.6)	0.578 (0.0348, 0.961)	4.397	.036*	-0.790	3.824	0.454 (0.206, 1.002)	.051
Education									
Low	79 (81.4)	152 (66.7)	0.456 (0.255,0.815)	7.632	.006-	-0.038	0.010	0.963 (0.457, 2.030)	.921
High	18 (18.6)	76 (33.3)	Ref					Ref	
Hardcore poverty									
Yes	31 (32.0)	77 (33.8)	1.086 (0.654, 1.803)	0.101	.750	0.163	0.225	1.177(0.601, 2.306)	.635
No	66 (68.0)	151 (66.2)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	32 (33.0)	59 (25.9)	0.790 (0.559, 1.118)	1.677	.195	-0.617	1.620	0.540 (0.209,1.395)	.203
No	65 (67.0)	169 (74.1)	Ref					Ref	
Alcohol drinker									
Yes	6 (6.2)	17 (7.5)	1.155(0.568,2.347)	0.171	.679	0.112	0.034	1.119 (0.337, 3.717)	.854
No	91 (93.8)	211 (92.5)	Ref					Ref	
Physically inactive									
Yes	43 (44.3)	121 (53.1)	0.782 (0.558,1.094)	2.083	.149	-0.522	1.775	0.594 (0.276, 1.279)	.183
No	54 (55.7)	107 (46.9)	Ref					Ref	
Inadequate vegetables intake									
Yes	43 (44.3)	131 (57.5)	1.447 (1.034, 2.025)	4.714	.030*	1.145	9.664	3.142(1.527, 6.468)	.002*
No	54 (55.7)	97 (42.5)	Ref					Ref	

Table 4.25, continued

Variable	Raised Blood Pressure, *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Metabolic Risks									
Abdominal obesity									
Yes	75 (77.3)	119 (52.2)	3.123 (1.817, 5.367)	18.754	<.001*	1.644	19.516	5.174 (2.495, 10.727)	<.001*
No	22 (22.7)	109 (47.8)	Ref					Ref	
Increased blood glucose									
Yes	12 (12.4)	6 (2.6)	5.224 (1.900, 14.361)	11.051	.001	1.144	3.919	3.139 (1.011, 9.740)	.048*
No	85 (87.6)	222 (97.4)	Ref					Ref	
Health Behaviour									
Knowledge score	-	-	1.001 (0.976,1.026)	0.002	.961	-0.001	0.005	0.999 (0.964, 1.034)	.942
Attitude score	-	-	1.040 (1.000,1.082)	3.890	.052	0.045	2.795	1.046 (0.992,1.103)	.095
Practices score	-	-	0.968 (0.828,1.131)	0.172	.678	-0.338	3.769	0.713 (0.507, 1.003)	.052
Constant						-3.352	2.723		.035

Abbreviations: *OR*, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, *Significance at $p < .05$

[b]Full model; Nagelkerke R^2=0.375; Hosmer-Lemeshow test=0.422 (p >0.05); Prediction power 80.9%; Collinearity: Minimum tolerance value 0.330 (>0.1), max VIF 3.027 (<10); Durbin-Watson, d = 2.125(1.5-2.5), no influential outlier, All interaction terms checked, not significant.
Dependent variable: Raised blood pressure (≧ 140mmHg systolic and/or 90 mmHg diastolic) * Significance at: $p < .05$

4.3.12.6 Factors Associated with Increased Blood Glucose

Table 4.26 presents the results that investigated the association between sociodemographic characteristics, behavioural and metabolic risk factors of NCDs , and KAP scores with increased blood glucose as the dependent variable. The results indicated that none of the factors provided a statistically significant improvement over the constant-only-model [$\chi 2$ (12, N= 325) =21.972, p = .038].

Multicollinearity test was conducted and it showed that multicollinearity was not present as all the VIF values were less than ten and tolerance values exceeded 0.1. The Durbin-Watson, d = 2.134 was between the two critical values of 1.5 to 2.5, thus indicating that the residuals were not correlated and the independent error assumption was satisfied. Therefore, the data met all assumptions for normality. The Nagelkerke R^2 value was 18.8% and the correct prediction rate was about 94.5%. The Hosmer-Lemeshow goodness of fit p-value was more than 0.05 ($\chi 2$= 5.679 df=8, p= .683), so the observed and predicted probabilities matched and the model fitted.

4.3.12.7 Factors Associated with Poor Knowledge towards NCDs

A logistic regression analysis was conducted to determine the sociodemographic characteristics and behavioural risks associated with with poor knowledge category (Table 4.27). The results indicated that the education level, income status, physically inactive and inadequate vegetables provided a statistically significant improvement over the constant-only-model [χ^2 (8, N= 325) = 39.277, p < .001].

Table 4.26: Factors Associated with Increased Blood Glucose Category (using Univariate and Multivariate Logistic Regression)

Variable	Increased Blood Glucose *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	6 (33.3)	170 (55.4)	Ref					Ref	
≧40	12 (66.7)	137 (44.6)	2.482 (0.908, 6.783)	3.347	.067	0.249	0.172	1.283 (0.395.4.160)	.678
Gender									
Male	4 (22.2)	90 (29.3)	Ref					Ref	
Female	14 (77.8)	217 (70.7)	1.452 (0.465, 4.530)	0.437	.508	0.364	0.243	1.439 (0.338, 6.117)	.622
Education									
Low	16 (88.9)	215 (70.0)	3.255 (0.763, 13.882)	3.491	.062	1.075	1.650	2.931 (0.568,15.119)	.199
High	2 (11.1)	92 (30.0)	Ref					Ref	
Hardcore poverty									
Yes	12 (66.7)	205 (66.8)	0.995 (0.363,2.728)	0.000	.992	-0.002	0.000	0.998 (0.306, 3.253)	.997
No	6 (33.3)	102 (33.2)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	6 (33.3)	85 (27.7)	1.306 (0.475, 3.590)	0.260	.610	0.374	0.243	1.454 (0.328,6.447)	.622
No	12 (66.7)	222 (72.3)	Ref					Ref	
Alcohol drinker									
Yes	0	23 (7.5)	-	-	-	-	-	-	-
No	18 (100.0)	284 (92.5)							
Physically inactive									
Yes	11 (61.1)	154 (50.2)	1.543 (0.613,3.880)	0.872	.350	0.537	0.672	1.710 (0.458,6.388)	.425
No	7 (38.9)	153 (49.8)	Ref					Ref	
Inadequate vegetables intake									
Yes	8 (44.4)	166 (54.1)	0.680 (0.261, 1.768)	0.632	.427	-0.556	0.681	0.574 (0.153, 2.147)	.409
No	10 (55.6)	141 (45.9)	Ref					Ref	

Table 4.26, continued

Variable	Increased Blood Glucose ,*n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Metabolic Risks									
Abdominal obesity									
Yes	16 (88.9)	178 (58.0)	5.798 (1.310, 25.657)	7.690	.005*	1.407	2.870	4.083(0.802,20.786)	.090
No	2 (11.1)	129 (42.0)	Ref					Ref	
Raised blood pressure									
Yes	12 (66.7)	85 (27.7)	5.224 (1.900,14.631)	11.051	.001*	1.198	3.845	3.315 (1.001,10.983)	.050
No	6 (33.3)	222 (72.3)	Ref					Ref	
Health Behaviour									
Knowledge score	-	-	1.018 (0.969,1.072)	0.507	.478	0.045	1.844	1.046 (0.980,1.117)	.175
Attitude score	-	-	1.010 (0.935,1.091)	0.063	.802	-0.035	0.537	0.966 (0.881, 1.060)	.464
Practices score	-	-	0.908 (0.665, 1.240)	0.370	.543	-0.121	0.172	0.886 (0.499,1.572)	.679
Constant						-3.680	1.028		.025

Abbreviations: OR, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, *Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.118; Hosmer-Lemeshow test=0.683($p > .05$); Prediction power 83.7%; Collinearity: Minimum tolerance value 0.326 (>0.1), max VIF 3.067 (<10); Durbin-Watson, d = 2.134 (1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable : Increased blood glucose (FBS of more than 6.1 mmol/L or RBG of more than 11.1 mmol/L), * Significance at $p< .05$

Table 4.27: Factor Associated with Poor Knowledge towards NCDs (using Univariate and Multivariate Logistic Regression)

Variable	Poor Knowledge *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	125 (38.5)	51 (15.7)	1.112 (0.683, 1.810)	0.182	.670	0.232	0.632	1.262 (0.711,2.237)	.427
≧40	109 (33.5)	40 (12.3)	Ref					Ref	
Gender									
Male	68 (20.9)	26 (8.0)	1.024 (0.600, 1.749)	0.008	.931	0.192	0.301	1.212 (0.610,2.4080	.584
Female	166 (51.1)	65 (20.0)	Ref					Ref	
Education									
Low	178 (54.8)	53 (16.3)	2.279 (1.364, 3.809)	9.745	.002*	0.651	4.770	1.917 (1.069,3.4360	.029*
High	56 (17.2)	38 (11.7)	Ref					Ref	
Hardcore poverty									
Yes	170 (52.3)	47 (14.5)	2.487 (1.506,4.107)	12.635	<.001*	0.987	11.955	2.684 (1.534,4.698)	.001*
No	64 (19.7)	44 (13.5)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	72 (22.2)	19 (5.8)	1.684 (0.946, 2.998)	3.303	.076	-0.672	3.363	0.511 (0.249, 1.047)	.067
No	162 (49.8)	72 (22.2)	Ref					Ref	
Alcohol drinker									
Yes	18 (5.5)	5 (1.5)	1.433 (0.516, 3.982)	0.505	.490	-0.011	0.000	0.989 (0.317, 3.082)	.984
No	216 (66.5)	86 (26.5)	Ref					Ref	
Physically inactive									
Yes	126 (38.8)	38 (11.7)	1.627 (0.997, 2.655)	3.842	.051	0.796	8.068	2.217 (1.280, 3.840)	.005*
No	108 (33.2)	53 (16.3)	Ref					Ref	
Inadequate vegetables intake									
Yes	113 (34.8)	61 (18.8)	1.234 (1.078, 1.412)	9.419	.002*	0.802	8.536	2.229 (1.302, 3.818)	.003*
No	121 (37.2)	30 (9.2)	Ref					Ref	
Constant						-0.516	0.924		.597

Abbreviations: *OR*, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, *Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.164; Hosmer-Lemeshow test=0.866 (p >0.05); Prediction power 72.6%; Collinearity: Minimum tolerance value 0.688 (>0.1), max VIF 1.454 (<10); Durbin-Watson, d = 1.798 (1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable : Poor knowledge category, * Significance at $p < .05$

Those with lower education and those in the hardcore poverty group were two times more likely to be in the poor knowledge category with *aOR* = 1.917; 95% CI 1.069, 3.436, *p*= .029 and *aOR* = 2.684; 95% CI 1.534, 4.698, *p*=0.001 respectively. The *aOR* for the coefficient of physical inactivity was 2.217 with a 95% CI (1.280, 3.840). Therefore, this finding suggested that those who were physically inactive were almost two times more likely to have poorer knowledge of NCDs (*p*= .005). Those with a inadequate daily intake of vegetables were 2 times more likely to have poor knowledge towards NCDs with *aOR* = 2.229; 95% CI 1.302, 3.818, *p*= .003.

The data met all the assumptions for normality for multicollinearity test for dependent variables of poor knowledge towards NCDs with Durbin-Watson value, *d* = 1.798. The Nagelkerke R^2 value was 16.4% and the correct prediction rate was about 72.6%. The Hosmer-Lemeshow goodness of fit p-value was χ^2= 3.197, *df*=7, *p*= .866.

4.3.12.8 Factors Associated with Poor Attitude towards NCDs

Table 4.28 presents the results from the final model that investigated the association between poor attitude category towards NCDs and sociodemographic characteristics and behavioural risks. The results indicated that the association between alcohol consumption, physical activity, and vegetable intake provided a statistically significant improvement over the constant-only-model [χ^2 (14, *N*= 325) = 34.882, *p* < .001].

Alcohol drinkers had five times higher odds of being in the poor attitude category with *aOR* = 5.150; 95% CI 1.586,16.726; *p*= .006. Those with insufficient physical activity were also two times more likely to be in the poor attitude category with *aOR* = 2.302; 95% CI 1.419,3.735; *p* = .001. Moreover, those who took less than

three servings of vegetables daily were two times more likely to be in the poor attitude category, with *aOR* = 2.261; 95% CI 1.414, 3.615, *p*= .001.

Linear regression was performed and the multicollinearity was checked. The Durbin-Watson, *d* =1.699, indicated that the residuals were not correlated and the independent error assumption was satisfied. The analysis showed the Nagelkerke R^2 was 13.6% and the correct prediction rate was about 60.9%. The Hosmer-Lemeshow goodness of fit *p*-value was more than .05 (χ^2= 4.315, *df*=8, *p* = .375), so the observed and predicted probabilities matched and the model fitted.

4.3.12.9 Factors Associated with Poor Practice towards NCDs

Table 4.29 presents the results from the final model that investigated the association between poor practice category towards NCDs and sociodemographic characteristics. There was no significant independent variables that provided a statistically significant improvement over the constant-only-model [χ^2 (4, *N*= 325) =13.626, *p* = .309].

Multicollinearity test was conducted and the results showed that multicollinearity was not present as all the VIF values were less than ten and tolerance values exceeded 0.1. The Durbin-Watson value, *d* = 1.650 indicated that the residuals are not correlated and the independent error assumption was satisfied. Therefore, the data met all assumptions for normality. The Nagelkerke R-square was 2.3% and the correct prediction rate was about 80.6%. The Hosmer-Lemeshow goodness of fit *p*-value was more than 0.05 (χ^2= 6.790 *df*=6, *p* = .341) so the observed and predicted probabilities matched and the model fitted.

Table 4.28: Factors Associated with Poor Attitude towards NCDs (using Univariate and Multivariate Logistic Regression)

Variable	Poor Attitude *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	90 (27.7)	86 (26.5)	0.995 (0.643, 1.539)	0.001	.981	0.026	0.010	1.026 (0.620,1.699)	.919
≧40	76 (23.4)	73 (22.5)	Ref					Ref	
Gender									
Male	50 (15.4)	44 (13.5)	1.127 (0.697, 1.827)	0.237	.627	-0.043	0.019	0.958 (0.518, 1.773)	.891
Female	116 (35.7)	115 (35.4)	Ref					Ref	
Education									
Low	122 (37.5)	109 (33.5)	0.786 (0.486, 1.271)	0.694	.327	0.183	0.434	1.201 (0.697,2.070)	.510
High	44 (13.5)	50 (15.4)	Ref					Ref	
Hardcore poverty									
Yes	108(33.2)	109 (33.5)	1.171 (0.737, 1.859)	0.447	.504	-0.171	0.425	0.843 (0.504, 1.409)	.515
No	58 (17.8)	50 (15.4)	Ref					Ref	
Behavioural Risks									
Smoking status									
Yes	53 (31.9)	38 (24.5)	0.670 (0.411, 1.092)	2.607	.108	-0.331	1.126	0.718 (0.390, 1.323)	.289
No	113 (68.1)	121 (75.5)	Ref					Ref	
Alcohol drinker									
Yes	19 (5.8)	4 (2.5)	5.009(1.665, 15.070)	10.692	.004*	1.639	7.436	5.150 (1.586,16.726)	.006*
No	147 (45.2)	155 (97.5)	Ref					Ref	
Physically inactive									
Yes	97 (29.8)	67 (42.1)	1.930 (1.242, 3.000)	1.930	.003*	0.834	11.406	2.302 (1.419, 3.735)	.001*
No	69 (21.2)	92 (57.9)	Ref					Ref	
Inadequate vegetables intake									
Yes	75 (45.2)	99 (62.3)	1.398 (1.128,1.732)	9.580	.002*	0.816	11.616	2.261 (1.414, 3.615)	.001*
No	91 (54.8)	60 (37.7)	Ref					Ref	
Constant						-0.630	1.718		.533

Abbreviations: *OR*, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, *Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.136; Hosmer-Lemeshow test=0.375($p > .05$); Prediction power 60.9%; Collinearity: Minimum tolerance value 0.688 (>0.1), max VIF 1.454 (<10); Durbin-Watson, d = 1.699 (1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable : Poor attitude category, * Significance at $p < .05$

Table 4.29: Factors Associated with Practice towards NCDs (using Univariate and Multivariate Logistic Regression)

Variable	Poor Practices *n* (%)		Crude *OR* (95% CI)[a]	χ^{2a}	*p*-value[a]	*B*[b]	Wald[b]	Adjusted *OR* (95% CI)[b]	*p*-value[b]
	Yes	No							
Sociodemographic									
Age group (years)									
18-39	139 (42.8)	37 (11.4)	0.957 (0.860,1.064)	0.659	.417	-0.322	1.097	0.725 (0.396, 1.324)	.295
≧40	123 (37.8)	26 (8.0)	Ref					Ref	
Gender									
Male	80 (24.6)	14 (4.3)	Ref					Ref	
Female	182 (56.0)	49 (15.1)	0.702 (0.408, 1.209)	1.777	.191	0.316	0.827	1.372 (0.694, 2.713)	.363
Education									
Low	182 (56.0)	49 (15.1)	1.538 (0.804, 2.946)	1.777	.194	-0.508	2.095	0.602 (0.302,1.197)	.148
High	80 (24.6)	14 (4.3)	Ref					Ref	
Hardcore poverty									
Yes	172 (48.3)	45 (12.9)	1.308 (0.716, 2.391)	0.780	.383	-0.164	0.263	0.848 (0.452, 1.591)	.608
No	90 (32.3)	18 (6.5)	Ref					Ref	
Constant						2.010	18.653		.001

Abbreviations: OR, Odds Ratio; CI, confidence interval; Ref: Reference group; *B*: logistic coefficient

[a] Likelihood Ratio (LR) test, *Significance at $p < .05$

[b] Full model; Nagelkerke R^2=0.023; Hosmer-Lemeshow test=0.341 ($p > .05$); Prediction power 80.6%; Collinearity: Minimum tolerance value 0.845 (>0.1), max VIF 1.184 (<10); Durbin-Watson, d = 1.650(1.5-2.5), no influential outlier, All interaction terms checked, not significant; Dependent variable: Poor practice category, * Significance at $p < .05$

4.3.13 Summary of Findings of the Quantitative Phase

Overall, from 325 respondents participated in this study, 14.8%, 5.2% and 4.3% had hypertension, hypercholesterolemia and Diabetes mellitus, respectively. For behavioural risks, the percentages of smokers and alcohol drinkers were 28.0% and 7.1% respectively. 50.5% were physically inactive, and 53.5% had inadequate vegetable intake. For metabolic risks, 59.7% of respondents had abdominal obesity. Among those who non-hypertensive, 24.5% had raised in blood pressure. And among those who non-diabetic, 4.2% had increased blood glucose.

For their health behaviour, the respondents with good KAP categories were 28.0%, 48.9% and 19.4%, respectively. Only 0.3 did not seek treatment when ill. 59.3% sought modern treatments, and another 40.7% relied on both traditional and modern treatments.

Results from the multivariate logistics regression analysis showed older age group of 40 years old above were significantly associated with hypertension, hypercholesterolemia and Diabetes mellitus. Non-smoker was significantly associated with hypertension. Those with hypercholesterolemia had significantly higher knowledge score. Physically inactive, increased blood glucose and knowledge score were significantly associated with Diabetes mellitus.

For metabolic risks, females and who had raised in blood pressure had higher odds of having abdominal obesity. Whereas, those in the hardcore poverty category less likely to have abdominal obesity. The older age group, inadequate vegetables intake group, abdominal obesity group and those with increased blood glucose had significantly higher the odds of having raised blood pressure category.

Lower education, hardcore poverty group, physically inactive and inadequate daily intake of vegetables were more likely to have poor knowledge towards NCDs. Alcohol drinkers, physically inactive group and inadequate vegetables were significantly associated with poor attitude category.

4.4 Qualitative Findings

This section presents the transcription of the respondents' interview and the patterns that emerged presented as the qualitative findings. The qualitative method was used to further explore the significant findings in the quantitative phase, namely knowledge and perception on modifiable and preventable behavioural risks of NCDs. Furthermore, the qualitative phase was designed to explore the perceived barriers to healthcare-seeking among the Orang Asli. As described, the content analysis method was applied in this study.

The first subsection provides the general characteristics of the Orang Asli who participated in this qualitative phase. The Orang Asli were selected based on predetermined criteria from the quantitative phase to explore their transitional change of from traditional lifestyle towards modernisation. It was followed by descriptions of knowledge and perception on behavioural risks of NCDs. The following subsection provides the Orang Asli's perceptions of modern healthcare system toward seeking help for their illness. There was also an analysis of the findings on traditional medicines used. At the end of this section, the triangulation method was presented to establish the validity of the qualitative findings.

4.4.1 Characteristic of Sampling Location in the Qualitative Study

This qualitative research was carried out in an Orang Asli community settlement situated in Kampung Orang Asli Ulu Kelaka, Jelebu district, Negeri Sembilan. There are a total of 42 houses in the villages with a total number of 193 peoples. This village opens in 2003 by government and is categorised as a fringe category. The settlement which are within 10 kilometres from the main roads and have characteristics such as being neighbours to Malay villages and experienced marked social changes.

The nearest main road is Jalan Kuala Klawang-Seremban located 1.6 km away, and the most adjacent Malay village is Kampung Kelaka which located 1.3 km from the village. The primary school which is Sekolah Kebangsaan Amar Penghulu located 1.8 km from the Kampung Orang Asli Ulu Kelaka. And the nearest public healthcare facility is Klinik Desa Ulu Klawang which found 1.7 km from the village.

Appendix 16 showed the photograph taken during the fields visit at Kampung Orang Asli Ulu Kelaka. At the new settlement area, this Orang Asli is resettled in brick detached houses provided by the government. Besides the houses, the settlement area is also equipped with basic facilities and amenities such as accessibility roads, electricity, water, badminton court, pre-school and a community hall. For the healthcare services, the local also received a visit from the mobile clinic provided by the government twice per month.

4.4.2 Theme 1: Development and Life Transition

Due to safety reason of often landslide in their previous placement, the government opened this new settlement in 2003. Many of the respondents were

relocated from the old villages nearby. They shifted to the houses provided by the government in the settlement.

> *"Akak memang asal orang kampung ini. Asal kampung lama dekat bawah sana. Disebabkan kerap tanah runtuh, kami dipindahkan ke sini. Dengan suami, rumah sendiri. Ada saya tiga orang anak. Satu perempuan, dua lelaki. Yang dah kahwin tu kakak dia. Dia kahwin dengan orang Kuala Pilah. Ada tiga orang cucu dekat rumah" (RG, 50 years old)*
> *[I was relocated from the old settlement near this village. There were frequent landslides in the old village. I received a house when the village was opened. In my house, there is one daughter and two sons. My daughter has already married people from Kuala Pilah. Now I have three grandsons. All of them stay in my house. (RG, 50 years old)]*

> *"Dahulu di sana, lepas itu pindah kampung ini. Dah lama" (D, 74 years old)*
> *[Last time, I lived in the old village, and then we moved to this village for a long time. (D, 74 years old)]*

> *"Akak ni dekat sini baru lagi. Sebab kampung lama dekat bawah sana" (R, 39 years old)*
> *[I'm new here. I relocated from the old village near here. (R, 39 years old)]*

> *"Dulu masa belum kahwin duduk dekat bawah sana. Dekat atas ni baru. masa tu belum lagi kahwin. Dah kahwin dapat rumah sendiri. Rumah PPRT" (F, 35 years old)*
> *[I am moving from the old village down here. This village is a new village. When I shift here, I still single. Now I am married and having my own house. PPRT house. (F, 35 years old)]*

While some of them were shift from other Orang Asli village in Jelebu to this village when its open. The respondent's comment showed that they were from the nearby Orang Asli villages before they married to the local villagers.

> *"Saya asal dari Kampung Orang Asli Jeram Lesung. Selepas kahwin, suami saya dapat satu rumah di kampung ini. Saya di kampung ini 16 tahun" (L, 51 years old)*
> *[I am from Kampung OA Jeram Lesung. After I got married, my husband received one house in this village. So I have been residing in this village for 16 years. (L, 51 years old)]*

> *"Ada lah 5 tahun saya datang sini dengan suami. Dulu dekat Kampung Chennah. Sekarang ini duduk di sini la Kelaka. Dekat kampung mak takda, ayah takda, saudara pun tak ada orang. Sudah habis dah di Kampung Chennah." (J, 53 years old)*
> *[I came here with my husband five years ago. Last time I stayed in Kampung Chennah. In that village, everyone passed away. My mum and my dad all already passed away. I have no siblings in Kampung Chennah. (J, 53 years old)]*

> *"Dulu saya dekat Jeram Lesung. Ikut mak ayah pindah umur 10 tahun. Suami saya orang Pilah" (JH, 27 years old)*
> *[We are from Kampung Jeram Lesung. I moved to this village with my parents when I was ten years old. My husband is from Kuala Pilah. (JH, 27 years old)]*

After getting married, some of them received their houses though the Housing Assistance Programme (PPRT) by the government while some took their initiatives to build their own house:

> *"Ya pindah. Masa tu dengan mak. Umur 17 tahun. Mula-mula duduk rumah mak. Masih kecil lagi. Dah berkahwin dapat anak kedua baru duduk sendiri. Dari kerajaan. Rumah PPRT" (S, 32 years old)*
> *[I moved to this village with my family when I was 17 years old. Initially I stayed in my mother's house. After I got married and gave birth to my second son, then only I received my own house through the PPRT by the government. (S, 32 years old)]*

> *"Rumah sendiri lah. Suami orang sini. Mak saya orang sini, bapa saya orang Pilah." (SH,52 years old)*
> *[I had my own home. My mum from here, my father from Kuala Pilah. (SH,52 years old)]*

> *"Lepas kahwin, rumah sendiri dengan suami dan anak-anak. Rumah kayu, buat sendiri. Selesa rumah sendiri" (NK, 33 years old)*
> *[After married, we built our own house using wood. My wooden house was comfortable as it is my own house that we built ourselves. (NK, 33 years old)]*

Nevertheless, some respondents, after getting married, still did not have their own homes. Therefore, they stayed at their parents or in-laws' house.

> *"Saya datang ke kampung ini masa saya masih kecil bersama keluarga. 2011 saya kahwin. Jadi dalam 8 tahun ini duduk dengan mak. Memang ada la perancangan duduk sendiri. kitorang cuba juga mohon rumah." (NH, 25 years old)*
> *[I moved to this village when I was a little girl with my family. It has been eight years since I married. I still stay at my parents' house. I do haveplans to have my own home. I also applied for a house from the government. (NH, 25 years old)]*

> *"Dah 8 tahun Menumpang rumah mak. Rumah ada dua bilik. Memang ada la perancangan untuk duduk rumah sendiri tapi belum lagi la." (Z, 24 years old)*
> *[It has already been eight years since I live in my in-law's house. The house only had two rooms. I had plans to have my own home, but until now, I have not owned it yet. (Z, 24 years old)]*

> *"Saya duduk Kampung Langkap, Pilah. Saya duduk sini ikut suami. Menumpang rumah mak. Suami memang orang sini" (Z, 24 years old)*
> *[I am from Kampung Langkap, Kuala Pilah. I moved here following my husband. Staying at in-law's house. He is a local villager. (Z, 24 years old)]*

> *"Saya asal Kampung Langkap. Saya datang ke kampung ini 2007, ikut suami saya. Sekarang duduk rumah mertua saya" (N, 29 years old)*
> *[I originated from Kampung Langkap. I came to this village in 2007 when I married my husband. I am currently staying at my in-law's house. (N, 29 years old)]*

Many respondents agree that following the placement to the village, the environment condition was better compared to the previous settlement:

> *"Kalau dibandingkan kampung lama tu kira macam pemandangannya lebih sempit. Ini lebih luas" (RG, 50 years old)*
> *[If compared to the previous village, which is narrower. This is more comfortable. (RG, 50 years old)]*

> *"Sihat lagi. Orang kampung sihat-sihat. Di sini lebih senang hati. Selesa." (D, 74 years old)*
> *[I am still healthy. People in this village are quite sturdy. Life here is happy. Comfortable. (D, 74 years old)]*

> *"Beza. Kalau dekat kampung lama dulu dia sempit, suasana pun tak besar macam ini. Yang sekarang ni besar la. Lebih luas" (F, 35 years old)*
> *[Compared to the old village, it is different here. At the old villages, it used to be quite narrow. The environment also not as big and broad as this village. (F, 35 years old)]*
> *"Adalah berubah, sebab dulu duduk dekat kampung lama dulu kawasan bukit-bukit. Ni ada lapang kan, terus sahaja. Rumah pun sama-sama. Dulu ada atas bawah. Jauh-jauh. Sekarang dah tak." (S, 32 years old)*
> *[In the old village, the house was on the hills. Now here is more spacious. The old houses used to be on top or bottom of the hills. We stayed far from each other. Currently, in this village, the houses are close to each other. (S, 32 years old)]*

In addition, the facilities provided in this village are also good:

> *"Kat sini memang senang sedikit la. Sebab air pun air paip. Kalau dekat kampung akak yang lama dulu nak ambil air kena buat gandar air. Susah." (R, 39 years old)*
> *[It is more convenient here. Even the tap water is also available. Last time it was difficult because we had to use a water axle.(R, 39 years old)]*

Nevertheless, the respondents expressed that the facilities provided caused them to have an obesity due to the reduced workload:

> *"Kalau dekat kampung lama dulu akak sekolah pun jalan kaki. Lampu suluh memang tak ada, pakai pelita. Kita keluar dari hutan pukul 5 pagi. Nak sampai ke sekolah pukul 6 lebih. Kalau dulu akak badan bukan macam ni. Kira macam kurus sikit la. Sekarang senang sedikit la. Sebab air pun air paip." (R, 39 years old)*
> *[When I was in the old village, I need to walk to school. There wasn't any torchlight, we used the oil lamps. We left the forest at 5 am and reached the school only after 6 am. In the past, my body was not like this, I was a lot thinner. I put on weight after I stayed in this village as life became a lot easier. Even the water is from the tap. (R, 39 years old)]*

The economic source also available in their placement to generate income for living. Many of the villagers working in agricultural activities such as rubber tapping and having a banana orchard. Some of the respondents' commented as below:

> *"Kalau dulu masa saya belum berkahwin la kan, masih remaja macam belasan tahun. Saya cakap terus terang la ya, memang dulu kita orang susah. Kalau sayurnya pucuk ubi. Itu biasalah dengan sambal tu. Tapi itulah, kata orang tu walau macam mana pun sekarang ada perbezaan dulu dengan sekarang. Kalau dulu dengan sekarang dari segi makanan memang ada perbezaan la. Dulu susah la. Sekarang kerja di kebun pisang. Di sini seperti itu lah, ambil daun pisang, tanam pisang. Ada juga yang menoreh." (RG, 50 years old)*
> *[Before this, when I was still a teenager and not married, life used to be very difficult. We only ate vegetables like shoots of tapioca with chilli paste. But that is, there is a difference between then and now. If in the past and now in terms of food, there is a difference. It used to be difficult. Now we work in the banana orchards. We can plant banana and also sell the leaves. We can also go for rubber tapping. (RG, 50 years old)]*

> *"Kebun ada. Kebun sendiri. Kat sini sekarang dah ada peruntukan daripada FELCRA." (S, 32 years old)*
> *[I also have my own farm under the provision from FELCRA. (S, 32 years old)]*

> *"Sekarang lagi senang la nak cari duit. Kalau cari daun pisang ada la duit." (NH, 25 years old)*
> *[Compared to last time, it is easier to get money as long as we go to work by finding banana leaves, then we can get money. (NH, 25 years old)]*

> *"Dulu susah sedikit lah. Sebab mak motong. Sekarang ok. Sekarang di sini ada kebun sendiri. Rumah sendiri." (JH, 27 years old)*
> *[It is different compared to last time. Last time, life was complicated. Mum used to go rubber tapping. Now we have our farming land. I also stay in my own house. (JH, 27 years old)]*

> *"Sekarang senang sikit la. Tak macam dulu la. Macam dulu susah, kalau tak kerja dalam hutan, tak panjat pokok petai memang tak berduit. Tak makan. Makan pun makan ubi. Sekarang makan nasi la petang pagi. Sekarang ada kebun sendiri. Kalau rajin usaha selalu banyak la dapat wang. Kalau tak selalu tak lah." (SH, 52 years old)*
> *[Nowadays life is a bit easier unlike last time. Before this, it used to be difficult. If you don't go to the forest and climb the bitter beans (petai) tree, we will have no money. When we don't have money, we have nothing to eat except tapioca. Nowadays, we can eat rice every morning and evening. Here we have our farm. If you are hardworking, then you can get a lot of money. If you are lazy, you earn nothing. (SH, 52 years old)]*

In addition to working in the village, due to available access to the town, some of the respondent working at the town.

"Dulu memang lah susah. Sekarang ini lebih senang nak cari makan. Dulu takda kebun, nak kena memancing. Sekarang ada kebun mak. Ambil daun pisang. Suami pun kerja luar. Sekarang lebih senang." (NK, 33 years old)
[Nowadays, life is a lot more comfortable. I have my mother's farm where I can go and take banana leaves to sell. My husband is also working at the town. Now it is easier to earn money to buy food. Back then, it was really hard. We don't have land to do farming. Therefore we need to go fishing to get food to eat. (NK, 33 years old)]

"Sumber ekonomi baik dekat sini. Mudah nak beli barang-barang. Tak jauh. Saya ada kereta sendiri." (F, 35 years old)
[The source of economy in this village is good. If we want to buy grocery, it is also very easy. I do have my own car. (F, 35 years old)]

4.4.2.1 Summary of Theme 1

From the interview with the respondents, the resettlement factor was due to relocation from their previous settlement or married to local villagers. While some had their house, many married Orang Asli still does not have their own house and thus stay at either their parents' or in-law's house.

From figure 4.23, it can be summarised that the environmental condition was more reasonable compared to the previous settlement due to the housing arrangement in the villages. Besides, the facilities available in the village were also excellent and made their lives more comfortable. In addition, they also could generate their source of income as they have their land for agricultural activities. The lands have been cultivated with rubber and fruit trees such as banana. Thus, they no longer rely on the forest for economic activities. Moreover, some of them also work in the nearby town area.

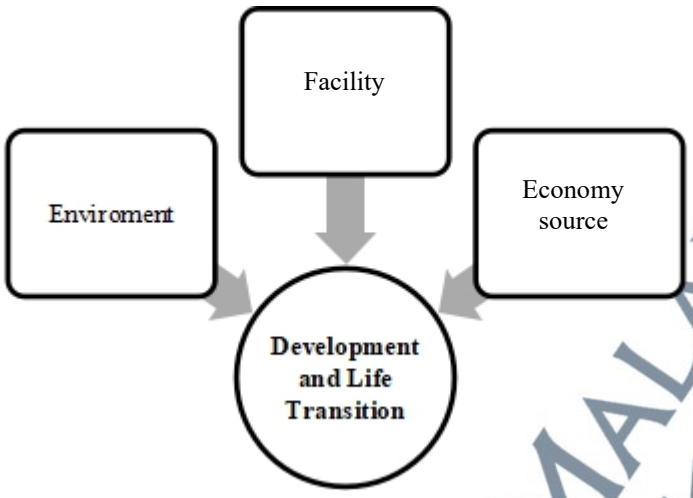

Figure 4.23: Summary of Theme 1 (Development and Life Transition)

4.4.3 Theme 2: Knowledge and Perception of NCDs

The health status of the villagers was generally good as commented by the respondents below. They attributed their good health to healthy behaviour and good environment:

> *"Semua orang dalam keadaan baik. Mungkin sebab dia jaga kebersihan ataupun makanan" (RG, 50 years old)*
> *[Everybody in this village is in a good shape. I think maybe they are taking care of their cleanliness and food intake. (RG, 50 years old)]*

> *"Makcik rasa semua orang sihat . Sedap duduk di sini" (D, 74 years old)*
> *[I think everybody in this village is quite healthy. This is because they are comfortable staying here. (RG, 50 years old]*

> *"Tahap kesihatan penduduk dekat kampung ini rasa memuaskan. Sebab mereka bekerja ambil daun pisang. Panjat bukit. Setiap hari" (NHA, 27 years old)*
> *[The health level of the villagers is satisfying as they are still active. They work by taking banana leaves to sell. They also do hill-climbing almost every day. (NHA, 27 years old)]*

In addition, respondents used words such as obesity and diet to explain NCDs. Additionally, a respondent also stated that the common diseases that affect the adults villager are chronic diseases. While the alcoholism caused illness to individual.

> *"Kalau pemakanan kalau terlebih sangat jadi macam kitorang ni lah; berlebihan berat badan" (NH, 25 years old)*

[When we overeat, then we become like this; obese. (NH, 25 years old)]

"Biasanya orang kampung ni mengidap kencing manis, darah tinggi. Kalau macam tak makan ke apa pun boleh sakit. Kalau orang sini kadang lewat makan"(F, 35 years old)
[The common diseases affecting the adult villagers are diabetes and high blood pressure. They are used to not eating anything. Sometimes they eat very late. That way, they can also become sick. (F, 35 years old)]

"Suami pernah juga ambil minuman mabuk. Lepas muntah darah terus berhenti. Lepas doktor cakap kalau awak minum lagi, minggu itu yang last la sebab boleh rosak dalaman, organ. Lepas itu dia terus berhenti." (NA, 29 years old)
[My husband used to drink. But he stopped taking alcoholic drinks already. At one time he was vomiting blood. The doctors advised him to stop drinking as it can damage the internal organ. If he continues, his condition will get worse. After that, he stopped drinking. (NA, 29 years old)]

There is also a respondent who had additional knowledge about the Quit Smoking Clinic provided by the government:

"Saya tahu la yang Klinik Berhenti Merokok tu. Dulu tu saya ajak suami pergi Klinik Berhenti Merokok. Dia tak nak. Kalau nak berhenti kena dari diri sendiri." (JH, 27 years old)
[I know there is a Quit Smoking Clinic available. I used to advise my husband to go to the Quit Smoking Clinic. But he doesn't want to go. For me, it depends on the individual if they really want to quit smoking. (JH, 27 years old)]

Some of the respondents experience the NCDs, either being diagnosed or having a family member with the illness:

"Doktor cakap darah tinggi je ada. Sekarang ada darah tinggi ini ada susah nak buat kerja kebun. Ada lah sakit-sakit la, sakit kaki. Ada lebih setahun tak jumpa doktor. Susah tak de apa tu kenderaan. Suami tak hantar. Tak ada ubat, tak buat periksa. Buku ada." (L, 51 years old)
[Since I developed hypertension, it's hard to do farming. I feel pain and aches, leg pain. I haven't seen a doctor for over a year. It's hard as I don't have transportation. My husband won't send me. There is no medicine, do not go for check-up. Treatment book are available (L, 51 years old)]

"Tah la, tak tahu sebab boleh jadi tak sihat. Keluarga semua sihat. Dulu arwah atok ada kencing manis. Tak tahu kenapa boleh sakit. Hari-hari makan ubat, periksa doktor. Ada sampai rosak buah pinggang, lagi strok sampai lumpuh." (NA, 29 years old)
[I don't know the factors that can give us good health or affect our health. Everyone in my family is healthy. But my late grandfather had diabetes. I don't know how he got diabetes. But he needed to take medicine every day and also to go for treatment. He was sick until at one stage, his kidney was damaged, he even got a stroke and became paralysed. NA, 29 years old)]

There is some of the respondents had limited knowledge on NCDs where they did not know the negative effect of alcohol consumption on health:

> *"Memang kenal, tapi tak pasti apa faktor yang mendorong dia minum. Tak pasti pula kesan minum-minum pada kesihatan." (NHA, 27 years old)*
> *[There is indeed someone that I know who drinks alcohol. I don't understand why they drink alcohol. I am also not sure of the negative effects of excessive alcohol intake to the body. (NHA, 27 years old)]*

> *"Tak pasti kenapa orang tu boleh nak ambil minuman keras. Tak ada kesan negatif kalau orang tu selalu ambil minuman alkohol." (F, 35 years old)*
> *[I'm not sure why do people take alcoholic drinks. For me, there is no negative impact of drinking alcohol to health. (NHA, 27 years old)]*

One lady with hypertension did not know the importance of nutrition for health:

> *"Tak tahu lah punca-punca nak bagi kesihatan. Pasal pemakanan, akak tak tahu lah." (L, 51 years old)*
> *[I do not know the factors that can give me good health. I do not know much about nutrition. (L, 51 years old)]*

While, some respondents had low knowledge on the importance of physical activities to maintain good health:

> *"Tak pasti aktif dengan tidak aktif kesannya kepada kesihatan dia." (L, 51 years old)*
> *[I am not very sure about the importance of physical activity and how it can affect our health. (L, 51 years old)]*

> *"Kalau saya tak buat aktiviti fizikal, apa kesan kepada diri saya. Entah la saya." (Z, 24 years old)*
> *[I do not know the impact of physical inactive on health. (Z, 24 years old)]*

> *"Tak tahu lah kesannya kepada kesihatan kalau akak aktif dan tidak aktif." (RD, 44 years old)*
> *[I wouldn't know the effects on health if we are physically active or inactive. (RD, 44 years old)]*

4.4.3.1 Summary of Theme 2

From the qualitative interview, some respondents reported that the health condition of the villagers was good due to the healthy behavioural factor and the environmental condition of the village. Nevertheless, some respondents said that the

common diseases affecting the villagers are chronic diseases. A respondent with chronic illness also claimed to have limitations in conducting her daily work activity. At the same time, some respondent had limited knowledge of the risk behaviour and cause of chronic diseases.

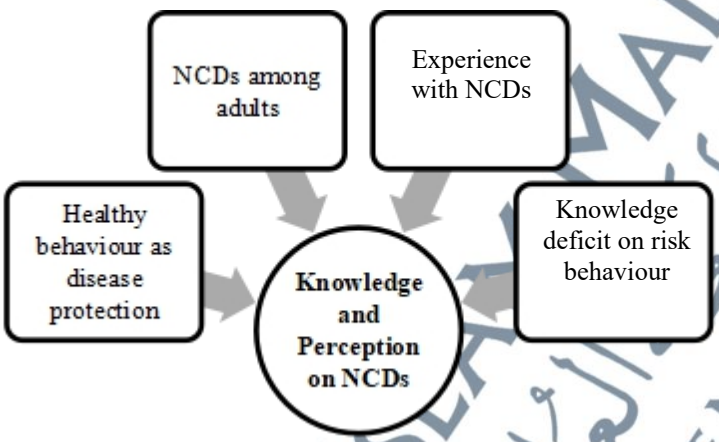

Figure 4.24: Summary of Theme 2 (Knowledge and Perception on NCDs)

4.4.4 Theme 3: Health Effects of NCDs Risk Factors

Many comments were made about smoking and alcohol behaviour and its effects on health. Many of the respondents had a good knowledge of this unhealthy behaviour and they agreed that this behaviour is unhealthy as it can affect health:

> *"Sama la tak baik. Dua-dua merokok dan minum air arak tu pun tak baik untuk kesihatan." (L, 51 years old)*
> *[I know that smoking and drinking alcohol are both not good for health. (L, 51 years old)]*

> *"Penting untuk elakkan gaya hidup yang tidak sihat macam merokok, minum arak. Kena elakkan benda tu kalau nak dapat kesihatan yang baik." (Z, 24 years old)*
> *[It is also important to avoid unhealthy lifestyles such as smoking and drinking alcohol. If we prevent this smoking behaviour, then we can get good health. (Z, 24 years old)]*

> *"Penting juga untuk kita elakkan merokok, minum minuman keras. Kalau minum jadi mabuk. Kalau ambik lama-lama buah pinggang dia pun hancur. Paru-paru dia rosak." (Z, 24 years old)*

[It is also important to avoid unhealthy lifestyles such as smoking and drinking alcohol. For alcohol drinks, if we take it, we will get drunk. If we take the drink for a longer time, then our kidneys and lungs will be damaged. (Z, 24 years old)]

"Kalau selalu minum boleh bawa mati." (ZB, 29 years old)
[I know if we take alcohol frequently it can bring death. (ZB, 29 years old)]

"Minum boleh buat kerosakan organ di dalam." (NK, 33 years old)
[Drinking alcohol can cause damage to the internal organs. (NK, 33 years old)]

On top of detrimental health effect, the villagers also felt disturbed by alcohol consumption because this behaviour caused a social problems in the community:

"Selain daripada mabuk, suka bergaduh. Bila kita cakap betul dia cakap tak betul." (JH, 27 years old)
[Alcohol drinking not only causes you to get drunk. It also can cause people to like to fight. Even if we said the right thing, they would say that it is not the right thing. (JH, 27 years old)]

"Memang pernah la tengok orang minum. Budak-budak. tengok orang tu minum saya pun marah. Kalau tengok orang mabuk bukan dia yang marah, saya yang marah. Kacau. Kau orang minum saya yang mabuk. Gaduh memang ada. Tapi saya tak nak tolong. Lantak kau lah. Tak ada penyakit cari penyakit." (SH, 52 years old)
[I have seen the youngsters in this village drink alcohol. For me, looking at the kids drink alcohol make me feel angry. When I see them get drunk, I feel angry as they have messed up. Sometimes they also get into a fight. But I wont help them. Leave them be. Looking for trouble when there is none to begin with. (SH, 52 years old)]

Many of them agreed that an active lifestyle is essential for health. Additional, respondents also commented by being physically active the can reduce the risk of getting obesity.

"Jaga kesihatan. Senam, pagi pergi menoreh, jalan kaki. Kena aktif. Lagi kita kurang gerak macam tu pun sama juga lah jadi sakit." (S, 32 years old)
[To maintain our health, we need to exercise. Every morning, we should go for rubber tapping and walking. We need to be active. If we lack movement, it can cause health deterioration. (S, 32 years old)]

"Nak la juga buat exercise macam regangan badan, aktiviti kesihatan. Sebab kalau kita tak aktif kita akan rasa macam lemah, sakit-sakit sendi kan. Sebab apa, sebab kita tak pernah buat aktiviti tu. Sebab kita asyik bekerja ja. Kerja dengan kita buat senaman lain. Ada perbezaan nya. Penting juga untuk kita keluarkan peluh badan. Mengurangkan berat badan pun boleh." (RG, 50 years old)
[We need to be physically active. Because if we are inactive, we will feel weak. We can also get painful joints. That is because we never did that activity. Because we are busy working. Working and workouts, there is a difference. It is also essential for us

to get sweaty. At the same time, we can reduce our weight so we do not become obese. (RG, 50 years old)]

"Nak sihat bersenam. Kalau tidak berat badan pun naik. Kebersihan penting juga."(JH, 27 years old)
[To maintain good health, we need to exercise. If we do not do any exercise, then we will put on weight. Cleanliness is also essential. (JH, 27 years old)]

Furthermore, some respondents specified the importance of a balanced diet and also reduced fat and sweet intakes:

"Dari segi pemakanan, makanan seimbang. Contohnya lah, dari segi pemakanan, kalau tak jaga memang sakit." (S, 32 years old)
[We can maintain our health by taking care of our nutrition and eating a balanced diet. If we do not take care of our diet, then our health will be declining. (S, 32 years old)]

"Jaga pemakanan. Kurang minyak, makanan yang berlemak, kurang minum minuman manis, kurangkan makanan tinggi kolesterol. Ada jaga lah juga. Kalau kita tak jaga pemakanan kesannya pada kesihatan." (NK, 33 years old)
[For us to maintain good health, we need to take care of our food. Watch out for our diet. Reduce oily and fatty foods. We also need to reduce high cholesterol foods and sweet beverages. I do practically all of that. If we do not take care of our diet, then it will affect our health. (NK, 33 years old)]

"Kalau macam rumah, biasalah denggi. Itu kebersihan la. Untuk kesihatan, jaga pemakanan. Kalau pemakanan, kalau terlebih sangat jadi macam kitorang ni lah; berisi/berlebihan berat badan." (NH, 25 years old)
[If we do not take care of the cleanliness at home, we can get dengue. We need to take care of our nutrition. If we overeat, then we can become overweight. (NH, 25 years old)]

4.4.4.1 Summary of Theme 3

For theme 3, it can be summarised that (Figure 4.25) many of the respondents commented that they knew the four modifiable risk behaviours that can deteriorate health. Some also acknowledged the lack of physical activities can cause obesity and that a balanced diet is important. Additionally, the respondents also agreed that excessive consumption of alcohol can cause social problems.

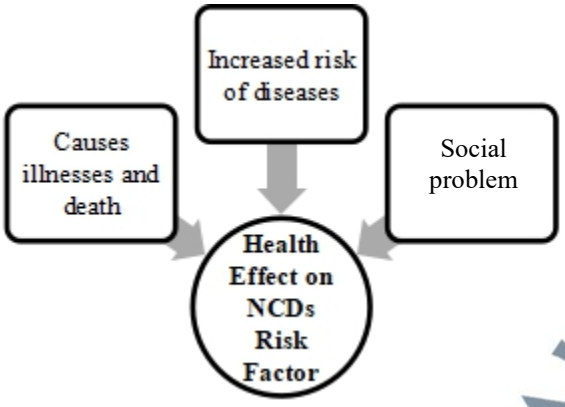

Figure 4.25: Summary of Theme 3 (Health Effect on NCDs Risk Factor)

4.4.5 Theme 4: Barriers to Preventing Behavioural Risk Factors

For smoking behaviours, several factors influenced a person's decisions to start smoking. According to the comments by the respondents, the factors included social characteristics, namely having friends who smoke and influenced them to start smoking:

> *"Budak sekarang. Kecil-kecil hisap rokok. Kawan-kawan merokok. Suami saya tidak merokok, anak ja." (L, 51 years old)*
> *[Kids nowadays, even though they are still at a young age, they have already started smoking. It was their friends who influenced them to start smoking. My husband is not a smoker but my sons smoke. (L, 51 years old)]*

> *"Kalau dari segi anak-anak memang saya pernah juga lah melarang kan. Saya pernah juga cubit-cubit anak saya merokok. Tapi saya tidak tahu macam mana. Mungkin dari segi pergaulan mereka la. Kawan itulah puncanya. Tapi kita tak tahulah. Anak-anak ada merokok sampai sekarang." (RG, 50 years old)*
> *[I have forbidden my kids from smoking. I have also pinched my children who smoked. However, their friends influenced them. So until now, they are still smoking.(RG, 50 years old)]*

Apart from that, another factor associated with the likelihood of smoking was the individual characteristics whereby they had the personal desire and just wanted to try it out certain behaviours:

> *"Macam budak-budak ini mula-mula diorang nak cuba-cuba. Mungkin ada kawan-kawan juga lah. Kalau kita cakap pun diorang bukan nak dengar. Memang payah la." (NK, 33 years old)*

[These kids, at first they want to try to smoke. It also influenced by friends too. If we told them to quit smoking, they wouldn't listen. It isn't very easy. (NK, 33 years old)]

"Tak tahulah kenapa nak rokok. Mungkin dia tengok seseorang itu macam sedap sahaja jadi dia pun nak cuba lah. Daripada cuba-cuba jadi tabiat. Kalau orang itu dah merokok, memang tak lah nk berhenti. Payah." (NH, 25 years old)
[I do not know why people want to smoke. I think they might think that smoking seems like fun, therefore they want to try it out. At first, they might just want to try it out but soon it became a habit. Once that person has started smoking, it is difficult to quit smoking. Impossible (NH, 25 years old)]

In addition, addiction made it difficult for them to stop smoking:

"Tak tahulah kenapa merokok. Kalau tak merokok pening kepala dia. Dah biasa merokok. Tak boleh nasihat. Susah." (RD, 44 years old)
[I do not know why they smoke. If they do not smoke, they will get headaches. They are so used to smoking. We cannot advise them to quit smoking. It is not easy. (RD, 44 years old)]

"Pernah la sekali sahaja rokok. Saja ja nk rasa. Ada juga lah nasihat diorang berhenti rokok tapi mereka tak dengar. Rasa macam ketagih dia nak hisap juga lah. Macam apa diorang cakap kalau diorang hisap dadah tu kan dah kena ketagih esok-esok nanti nak hisap juga." (J, 53 years old)
[I did smoke once last time. At that time, I simply want to try it. I did advise my family members to stop smoking but they did not listen. Once they started to smoke, they became addicted. Like what people say, smoking is like taking drugs. Once you take it, you will get addicted to it. (J, 53 years old)]

"Saya tidak. Suami saya. Merokok memang la tak boleh tinggal-tinggal la. Tak tahu lah. Suami saya, saya kata berhenti la merokok tu, tengok macam saya tak merokok tak mati. Makan sahaja. Tapi dia cakap dah biasa." (SH, 52 years old)
[I am not a smoker, but my husband is. He cannot live without smoking. I did tell him to quit smoking, but he said he is used to it. (SH, 52 years old)]

Many of the respondents commented that they advised their family members to quit smoking. However, their advice was not taken into account:

"Anak-anak, arwah suami pun sama merokok. Mungkin sedap ke, tak tahu lah. Sudah puas cakap. Tapi dia tak nak dengar. Arwah abang semasa sakit cakap, tidak apa selagi nafas saya masih ada saya terus. Susah. Kita sudah ingatkan jangan merokok, tapi dia tak nak dengar. Susah kita nak cakap." (D, 74 years old)
[My son and late husband are both smokers. I don't know why they smoke. Maybe it is delicious. I always advise them to stop smoking but they never listen to me. It is hard to encourage them to stop. Even my late husband, I told him to quit smoking when he fell sick. But he said he would continue to smoke until his last breath. (D, 74 years old)]

"Akak tak tahu kenapa mereka merokok sebab akak tak pernah. Nak berenti rokok itu akak susah nak cakap sebab suami akak pun merokok. Bila akak cakap berhentilah merokok, dia buat tak tahu sahaja." (R, 39 years old)

[I don't know why they smoke or the factor that influences them to smoke. It is hard to ask them to quit smoking, as my husband also a smoker. When I asked him to quit smoking, he did not listen. (R, 39 years old)]

Some of them even had given up on advising their family member to quit smoking as it was almost impossible:

"Dari segi pandangan mata akak, takda lah. Tak mungkin berhenti. Contohnya macam arwah bapa saya, bila mak saya cakap abang jangan lah merokok abang sakit. Lagi dia cakap selagi saya masih hidup dia cakap saya terus." (RG, 50 years old)
[From my point of view, a person cannot quit smoking. For example, like my late father, when he was sick, my mum told him to stop smoking. However, he said that as long as he is alive, he will continue smoking. (RG, 50 years old)]

"Ada. suami saya, ayah mertua pun merokok. Tak tahu la kenapa merokok. Susah nak berhenti. Memang tak boleh nak berhenti." (NA, 29 years old)

For risky alcohol intake, there was mixed opinion on the factors that influenced alcohol consumption among the respondents, for example, peer-influence from their friends:

"Kawan-kawan la buat minum. Kalau kita bagitahu pun jangan minum, orang cakap nanti dia melenting la." (L, 51 years old)
[Its was the influence from friends. If we tell them the negative effects of alcohol drinking, they will get angry at me. (L, 51 years old)

"Dulu suami pernah juga minum, terpengaruh kawan-kawan." (NA, 29 years old)
[Last time, my husband used to drink alcohol, his friends influenced him. (NA, 29 years old)]

Others commented that alcohol were available in the village. So, when they had extra money to spend, they would use it to buy alcoholic drinks. While some consume alcohol as a stress management strategy. Moreover, the respondent also commented that alcohol consumption was the personal choice of an individual and lead to addiction.

"Tak tahulah kenapa minum. Kadang kalau dapat duit diorang minum hari-hari. Kalau tiada duit tak lah. (SH, 52 years old)"
[I don't know the reason they take this alcoholic drink. Sometimes if they get money, they will use the money to buy alcoholic drinks. If they don't have money, then they would not buy it. (SH, 52 years old)]

"Suami ada minum tu sekali sekala la. Sebab dia ada duit. Tapi dia tak selalu macam yang lain ni. Tidak sehingga ketagih. (NK, 33 years old)"
[My husband also occasionally takes the drink. He drinks because he has money. But not as frequent as the rest. Not until addicted. (NK, 33 years old)]

"Diorang ni kadang-kadang ada masalah keluarga, masalah kewangan . Diorang rasa macam stress la nak ambil itu. Ada orang jual di kampung. " (NA, 29 years old)
[They also takes alcohol because they was stressed out due to family and financial problems. In this village, some people are selling these drinks to the villagers. (NA, 29 years old)]

"Ada. Pernah tengok la dia orang minum. Rasanya mungkin diorang ada masalah kerja ke ada masalah diorang bawa ke rumah, diorang minum." (NK, 33 years old)
[I have seen the villagers drink alcohol. It seems that they have a problem at working place or at homes, that's why they take alcohol. (NK, 33 years old)]

"Pada pandangan kakak la, bukan sebab stress atau apa. Dia memang nak minum. Sebab kalau stress pun, minum mabuk, tak hilang pun stress. Kesan jangka panjangnya apabila dia dah minum, ketagihan la. Daripada cuba rasa jadi ketagih." (RG, 50 years old)
[From my point of view, they drink alcohol, not because of stress or anything. They want to take the drink. Because if they did it due to stress, then drinking alcohol would not reduce the stress level. As first, they just wanted to try, then they became addicted to the drink. (RG, 50 years old)]

For many respondent, they are interested in conducting physical activities. If there is an available facility to conduct physical activities, then it would be beneficial for the villagers:

"Kalau ada tu penting juga lah. Sebab kita tak pernah kan. Nak la juga buat exercise macam regangan badan, aktiviti kesihatan. Berkebun tak cukup. Kena tambah dengan aktiviti lain." (RG, 50 years old)
[I think if it is available, then it will be great. Because we never did it. We also want to do exercises like stretching and other health activities. I think gardening is not enough and we need to do other physical activities. (RG, 50 years old)]

"Ada takda pun kat padang itu sahaja lah (gelanggang badminton). Tiada halangan nak beraktiviti. Kalau macam saya, saya minat lah bersenam." (NH, 25 years old)
[The only place that we have in this village to conduct physical activities is this small field (badminton court). There is no obstacle if (you) really want to do some activities. As for me, I'm interested in exercising. (NH, 25 years old)]

However, the was a limited number of facilities available and authoritarian to conduct physical activities in the village. Many of them relied on household work and farming activity as part of their physical activities:

"Ada lah tempat nak bersenam. Padang adalah yang kecil ini. Kalau macam akak kena pergi kebun jugak la nak bersenam." (L, 51 years old)
[There is a place to conduct physical activities, a small field. If adults like me wanted to do physical activities, then we take a short walk to walk to the orchard. (L, 51 years old)]

"Tak ada lah tempat nak bersenam. Berkebun sahaja. Kalau tak ke kebun, basuh kain, kemas rumah." (JH, 27 years old)
[There is no place to do activities such as jogging. We only do gardening. If not, we wash laundry and do house chores as an exercise. (JH, 27 years old)]

"Ya, kadang-kadang kita yang besar ini nak buat aktiviti juga. Tapi tiada padang. Dia macam ada halangan la. Kalau kita buat permohonan tu tidak lulus. Diorang cakap sebab keadaan kampung saya tiada kawasan yang luas. Semua bukit. Jadi susah lah." (RG, 50 years old)
[There is a barrier to conduct physical activities in this village. We did write in for application but it was not approved. The reason given by them is that there is no spacious area in the villages. All hilly. Therefore, it is not very easy for them to build any physical activity facility. (RG, 50 years old)]

Another barrier to physical activity was that they did not have enough time to exercise as they needed to take care of their children:

"Susah, sebab tak larat. Ada anak-anak. Tak cukup masa. Dulu ada la senam. Nak buat apa semua boleh buat. Sekarang ini bila buat lebih sedikit rasa letih sangat." (NHA, 27 years old)
[It is not very easy to carried out physical activities as I have children, so I don't have much time. Last time I used to be quite active. It was easier back then to do anything I want. Nowadays, when I do a bit of work, I will quickly get tired. (NHA, 27 years old)]

"Berjoging tak pernah la. Selalu berjalan. Ada juga la susah nk berjalan, sebab ada anak dekat rumah." (RD, 44 years old)
[I never go for a jog. I only do walking. It is also challenging to go for a walk as I have a child at home. (RD, 44 years old)]

For vegetable intake, one of the barriers in this behaviour was the reduction in crop production due to environmental factors such as animal disturbance and weather:

"Kalau nak duit, jual daun pisang. Cucu ada nak beli barang rumah. Selalu beli barang makanan dari luar. Ada ubi, tanam, babi datang. Habis hancur semua." (D, 74 years old)
[If I need money, I will go and sell banana leaves. To buy food, my grandson can go to the shop. We need to buy from outside. We planted tapioca on our farm before but a pig came and destroyed all the plants. (D, 74 years old)]

"Makan sama sahaja. Makan pucuk ubi pun sama sahaja. Cuma sekarang susah nk dapat pucuk ubi. Susah la. Sebab panas sekarang ini." (ZB, 29 years old)

[My food intake is still the same compared to before. I only eat tapioca leaves. But it is difficult to get traditional food like tapioca shoots because the weather is hot nowadays. (ZB, 29 years old)]

As for fruit intake, it was also influenced by seasonal factor. The fruits available in the village were limited. They could only eat fruits during the fruit season when plenty of local fruits such as *rambutan* and *durian* available:

"Kalau macam pucuk ubi dapat la cari dekat kebun, pucuk betik. Sayur lain kena beli la, tak lah jauh sangat. Boleh la. Beli sendiri buah. Kadang-kadang kalau ada time musim senang la. Musim rambutan, durian macam tu. Tak terbeban sangat la nak beli, tengok pada budget la." (Z, 24 years old)
[The vegetables available in these villages are like tapioca and shoots of papaya. Other vegetables we need to buy. For fruits, we need to buy. However, during the fruit season, there are plenty of fruits available such as rambutan and durian. It depends on the financial budget to buy fruits and vegetables. It is not far from these villages. (Z, 24 years old)]

"Tak susah. Sebab di dalam kampung ini pun ada orang meniaga sayur, ayam, ikan. Duit sahaja susah nak cari kan. Ada makan sayur. Buah kadang-kadang ada la. Ikut musim." (NA, 29 years old)
[There is a seller in this village who sells vegetables, chicken, and fish. It is not very difficult to get these food but we need to have money. Money is hard to find. I seldom take fruits except during the fruit seasons. (NA, 29 years old)]

"Buah tu kena beli lah. Kalau tiada musim tiada buah la." (NH, 25 years old)
[For fruits, we need to buy it. If it is not a fruit season, then there will be no fruits available in this village. (NH, 25 years old)]

Since some of them needed to buy the vegetables or fruits from outside the village, they depended on the availability of transportation:

"Kalau macam buah-buahan memang susah la. Kena beli." (NK, 33 years old)
[To get fruits in this village is difficult. We need to buy them. (NK, 33 years old)]

"Dulu akak makan ubi kayu, ubi keledek itu ja. Kadang nak makan sayur, sayur hutan. Sekarang taklah. Sekarang sayur di luar. Ayam ikan. Kena beli. Akak nak beli di luar kena tunggu suami nak pergi." (R, 39 years old)
[Last time when we want to eat vegetables, we can crop the vegetables like the tapioca or sweet potatoes from the farm. Now we don't do that. Now vegetables are bought from outside. Same with fish and chicken. We need to buy them. I need to wait for my husband to take me to buy vegetables or fruits outside the village. (R, 39 years old)]

"Ada la. Kadang beli, kadang ambil sendiri sayur. Ada juga lah susah nak beli. Kadang ada la sepuluh, dua puluh ringgit….. Naik motor lah bila nak beli." (J, 53 years old)

[I do buy fruit and vegetables. Sometimes there is no money to buy food, and sometimes we had only ten or twenty ringgit to purchase food…… We need to ride the motorcycle to purchase food. (J, 53 years old)]

Some of them also added that due to financial constraint, they faced a limited availability of vegetable and fruit for consumption:

"Sayur ada la berubah. Kadang beli. Kadang daripada kebun sendiri. Pucuk ubi, pucuk paku. Sekarang ni susah nak beli kat luar. Susah. Tak ada duit tak ada kenderaan. Kadang-kadang sebulan sekali baru keluar pergi beli." (NHA, 27 years old)
[There is a change in the vegetable intake compared to previous years. Sometimes we get the vegetables from the plants in our farm. Tapioca shoots. Now it is harder because we need to buy. I don't have transport or money. Sometimes I go out to buy only once a month. (NHA, 27 years old)]

"Susah nak beli sayur. Wang pun tiada. Susah la. Sebab saya nak beli pun jauh. Ada motor sahaja." (ZB, 29 years old)
[To buy vegetables, we need to have money, it's difficult since I don't have money. It's also difficult to buy since the shop is quite far from the village. I only have a motorcycle as my mode of transportation. (ZB, 29 years old)

"Ada juga lah susah. Sayur, buah kena beli. Ada motor. Pucuk ubi ada lah di sini. Kalau ada duit beli lah. Kalau tak ada duit, tak beli. Makan sikit-sikit la. Pucuk ubi, ikan masin." (RD, 44 years old)
[We need to buy vegetables and fruit to eat. Only tapioca shoots are available in this village. If there is no money, then we won't buy it. During the hard times, we only eat a little bit. Tapioca shoots and salted fish. (RD, 44 years old)]

4.4.5.1 Summary Theme 4

Behavioural lifestyle factors were closely influenced by smoking, harmful use of alcohol, physical inactivity, and unhealthy diet shown in Figure 4.26. For smoking, the dominant influences of this behaviour were social pressure, availability and personal desire. For alcohol consumption, it was influenced by availability, social pressure, stress, individual desire, and extra money to spend. Addiction made it almost impossible to quit both smoking and alcohol consumption. Reduced physical activities can be due to a lack of facility and authoritarian, and time constraint. Fruit and vegetable intake was influenced by environmental determinant, financial constraint, and transportation issue.

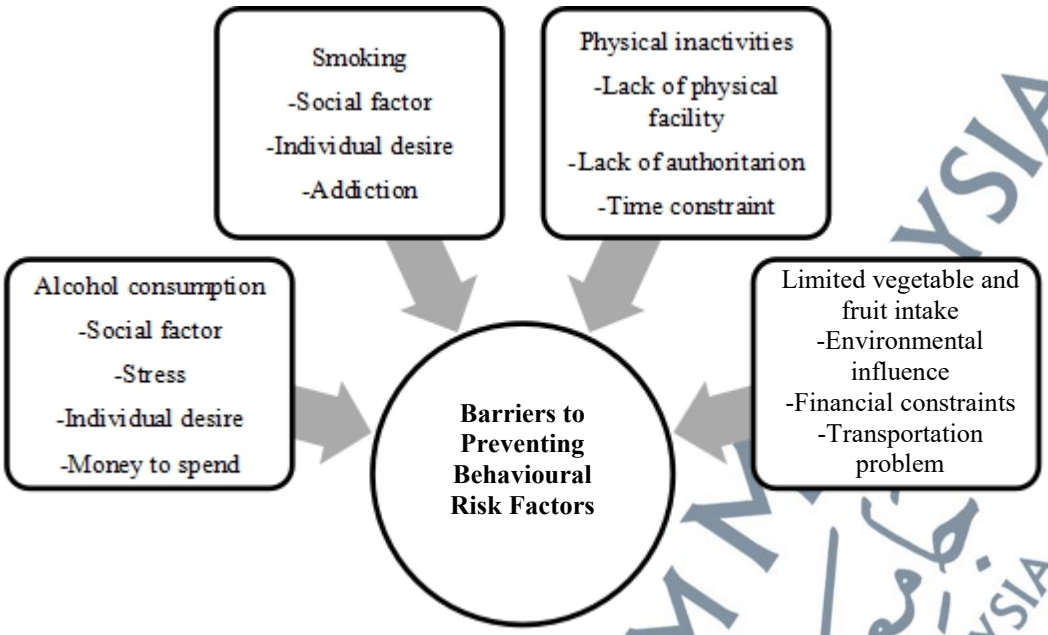

Figure 4.26: Summary of Theme 4 (Barriers to Preventing Behavioural Risk Factors)

4.4.6 Theme 5: Utilisation of Modern Medicines

This theme had the following subtheme of i) accessibility to healthcare facilities, ii) attitude to modern treatment, iii) barrier to accessing medicine and iv) traditional knowledge deficit.

4.4.6.1 Traditional Knowledge Deficit

The respondents described that traditional knowledge was passed down through the lessons from previous generations:

> *"Takda ambil ubat kampung. Saya tak tahu sangat. Tiada yang ajar." (NA, 29 years old)*
> *[I did not take any traditional medicine. I don't know much about traditional medicine. Nobody taught me the knowledge. (NA, 29 years old)]*

> *"Lagi senang guna kemudahan yang ada. Saya tiada kemahiran ubatan kampung. Adalah dulu arwah atok. Ajar sedikit-sedikit. Apabila dia tiada tradisi tu bukan saya tak nak tapi tak paham nak buat. Takut. Jadi bukan mudah untuk kita nak buat ni. Susah. Macam akak ni akar kayu semua nya ada. Bukan tak boleh berubat macam orang dulu. Boleh. Tapi macam saya, saya tidak faham. Sekarang pun kita nak cari dalam hutan tu, jauh. Nak kena ada ilmu." (RG, 50 years old)*
> *[It is more convenient to use existing modern healthcare facilities. The traditional practice of medicine were not easy for us. It is not very easy. Previously, my late*

grandparents have taught me. However, when he died, it is not that I do not want to continue the practice, but I do not understand how to do it. I also have no skills. The natural sources like the roots are still available in the forest. However, for me, I do not understand. It is also quite faraway to find them in the forest. We need to have the knowledge to look for them. (RG, 50 years old)]

Since they had limited traditional knowledge, they had to rely on modern medication for the treatment of illness:

"Sedikit sahaja saya tahu pasal rawatan kampung. Kalau tahu memang senang sedikit. Sekarang saya guna ubat doktor sahaja." (JH, 27 years old)
[I know very little about traditional medicine. If you know more about traditional medicine, then it will be easier to get the medication. As for me, I use modern medication. (JH, 27 years old)]

"Tiada ambil ubat kampung. Takda ambil akar-akar kayu. Hospital. Ambil dekat hospital sahaja." (NK, 33 years old)
[I no longer take any traditional medicines. I also did not take tree roots from the woods. I will go to the hospital. (NK, 33 years old)]

4.4.6.2 Accessibility to Healthcare Facilities

For many of the respondents, the accessibility to government healthcare was excellent:

"Klinik semua ok. Kalau anak sakit, kita bawa pergi klinik." (L, 51 years old)
[The clinic facilities were excellent. If any of our children is sick, we will bring them to the clinic. (L, 51 years old)]

"Ambil ubat doktor la bila sakit. Dulu batuk berdarah. Sekarang elok sudah. Makcik pergi hospital, ambil ubat doktor. Jumpa doktor baru boleh sihat la." (D, 74 years old)
[I took modern treatment when I was sick. Previously I had a cough with blood. I went to the hospital and I took the medicine given by the doctor. After seeing the doctor, I became healthier. I no longer have those problems. (D, 74 years old)]

As stated by the respondents, it is essential to have healthcare facility near their homes as they rely on modern medication for the treatment of illness:

"Bagi saya penting ada tempat kesihatan macam klinik, hospital. Buat masa sekarang saya memang dengan doktor sahaja. Baik lah kemudahannya." (S, 32 years old)
[For me, it is vital to have our houses close to healthcare facilities such as clinic and hospital. For the time being, I only take medicine from the doctor. The facilities were excellent. (S, 32 years old)]

"Penting la ada tempat kesihatan. Kadang saya pergi hospital dekat Petaling. Dekat sahaja. Suami hantar naik kereta." (JH, 27 years old)
[It is crucial to have a healthcare facility near our house. I used to go to the hospital near Petaling. It is also not very far to go to the clinic. If we need to go to the hospital, my husband will send me by car. (JH, 27 years old)]

"Kalau rumah dekat dengan tempat kesihatan lagi bagus lah." (NK, 33 years old)
[If the healthcare facilities are close to our homes, then it will be even better. NK, 33 years old)]

4.4.6.3 Attitude to Modern Treatment

Some of the respondents had a good attitude towards healthcare behaviour. They received a regular check-up for health monitoring purposes:

"Tempat kesihatan tu penting la. Kalau kita tak pergi klinik pun bahaya juga. Penting, check kesihatan. Walaupun tak sakit kena check juga. Kalau akak dengan suami memang ada check. Kemudahan kerajaan pada akak tiada masalah." (Z, 24 years old)
[Healthcare facilities are essential. If we do not go to the clinic, it is also dangerous. It is essential to do health check-ups. Even though we are not sick, we still need to go for a check-up. I do this with my husband and also my family. I also encourage my husband to do a health examination. For me, there is also no problem with the health facilities provided by the government. (Z, 24 years old)]

"Kesihatan di sini memang terbaik la. Tiada masalah. Sebab anak-anak pun ada motor nak hantar.Ada pergi check. Dah biasa dah kan. Takda kencing manis, darah tinggi. Kalau sakit jumpa doktor, ambil ubat." (RG, 50 years old)
[Healthcare facilities here are the best. If I need to go to the clinic, my kids will send me there with their motorcycles. My health condition is satisfying. I do not have hypertension or diabetes. I am used getting a check-up, I am not afraid. If we get sick, we need to see a doctor for treatment and take the medicine.(RG, 50 years old)]

However, a respondent stated that for common illnesses, they would take the modern medication. However, for the treatment of chronic illnesses, the villagers still preferred traditional medication:

"Orang kampung ni, macam ubat tahan sakit, demam biasa ambil ubat doktor. Kalau kencing manis, darah tinggi Selalunya diorang makan ubat sendiri. ubat kampung." (F, 35 years old)
[Many of the villager will take modern medicine such as painkillers. If mild fever they will just take medication from the doctor. For diabetes and high BP, they usually take their own medication. Traditional village medicine. (F, 35 years old)]

Another respondent expressed that while it is important to take modern medication for the treatment of illness, some of their family members rejected modern medication out of fear:

> *"Memang la penting kemudahan kesihan tu. Macam kalau ada pening kepala, makan la ubat doktor. Suami saya, tak tahu lah. Bila sakit suruh pergi hospital, dia tak nak. Tak boleh cakap hospital." (SH, 52 years old)*
> *[Of course it is crucial to have modern healthcare facilities close to us. I take medicines from doctors too. If I have a headache, I will take modern medication. However, when my husband was sick, I asked him to go to the hospital he refused. We cannot even mention about the hospital to him as he was afraid to go to the hospital. (SH, 52 years old)]*

4.4.6.4 Barrier to Accessing Medication

The qualitative interview identified several barriers with regard to the use of modern healthcare facilities. As commented by the respondents with hypertension, she was unable to continue her follow-up treatment due to transportation problem:

> *"Sekarang ada darah tinggi ini ada susah nak buat kerja kebun. Ada lah sakit-sakit la, sakit kaki. Ada lebih setahun tak jumpa doktor. Susah tak de apa tu kenderaan. Suami tak hantar." (L, 51 years old)*
> *[Since I had hypertension, it's hard to do farming. There is a pain in the leg, leg pain. Haven't seen a doctor for over a year. It's hard as I don't have transportation. My husband didn't send. (L, 51 years old)]*

They also relied on their family members to receive treatment. If their family members were reluctant to send them, then they would have limited access to the facility:

> *"Aaa, susah nak ke hospital sebab nya nak tunggu pada suami lah hantar. Boleh bawa motor. Lesen tiada." (L, 51 years old)*
> *[I depend on my husband to send me, but he does not want to send me. I know how to ride a motorcycle but I do not have a license (L, 51 years old)]*

> *"Kalau sakit, kena juga keluar klinik. Adalah suami hantar sana." (R, 39 years old)*
> *[If I am sick, I need to go to the clinic near town. I need my husband to send me there. (L, 51 years old)]*

Hospital Jelebu, located in Kuala Klawang near the village, is a non-specialist district hospital that provides outpatient and inpatient services. For patients requiring

specialist care, they will be referred to in Hospital Tuanku Jaafar in Seremban, the capital of Negeri Sembilan, 30 km from Kampung Orang Asli Ulu Kelaka. Therefore, the distance was the main barrier for them to get certain treatment from the facility:

> *"Dulu, empat tahun lepas masa mengandung anak yang ni ada sakit tiroid. Dah lama. Selalu pergi dekat Seremban. Dah lama tak pergi check. Jauh nak pergi." (RD, 44 years old)*

Among the patients with NCDs, forgetfulness was the most frequently reported reason for non-compliance to their follow-up schedule:

> *"Kalau ada kencing manis, darah tinggi ambil ubat di Klinik Desa dekat kampung ni. Bawah sahaja. Cuma macam susah diorang nak pergi. Kadang diorang lupa." (F, 35 years old)*
> *[For those with diabetes and high BP, they need to take their medicine at Klinik Desa near this village. Even though it is just nearby the village, it is had for them to go. Sometimes these people just forget. (F, 35 years old)]*

4.4.6.5 Summary Theme 5

Subtheme 5 was categorised into accessibility, attitude, barrier to modern healthcare facilities and traditional knowledge deficit (Figure 4.27). Due to limited knowledge of traditional medicine, they relied on modern medication for the treatment of illness. Many of the respondents agreed that the accessibility to modern healthcare facilities was excellent and the importance of having access to modern treatment. As for the attitude towards modern healthcare, many of them had a good attitude. However, some of the respondents still believed in traditional medicine for the treatment of illness including for chronic diseases. Several barriers to the use of modern healthcare facilities that were identified included transportation, distance, dependency factor, fear, and non-compliance due to forgetfulness.

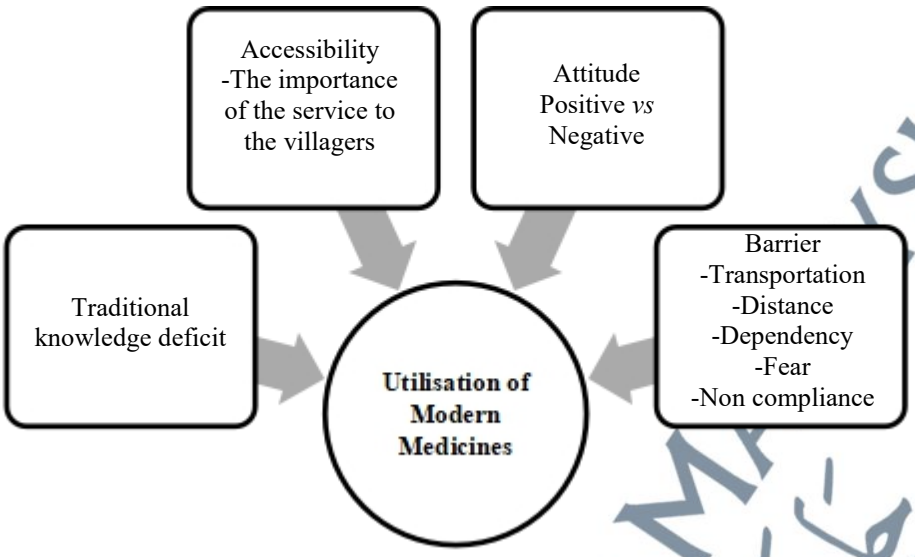

Figure 4.27: Summary of Theme 5 (Utilisation of modern medicines)

4.4.7 Theme 6: Traditional Medicines

Concerning the traditional medicines used, some respondents resorted to seeking complementary medicines used herbs or natural sources. Respondents considered traditional medicines easily accessible and to a certain extent, comparably affordable. A respondent said that she used traditional food as an energy drink. Unfortunately, the younger generation did not seem to be interested in traditional knowledge:

> *"Minumlah. Ambil akar-akar dekat hutan tu. Untuk tenaga. Suami saya tahu la. Memang ada la ajar anak-anak. Tapi anak-anak saya tak nak. Saya makan sorang la." (SH, 52 years old)*
> *[We need to take the tree roots from the forest to maintain good health. It is for energy. My husband knows how to look for them in the woods. I did teach my kids about traditional food and medicine. But my kids do not want to take it. So I take it myself. (SH, 52 years old)]*

Some of the respondents also commented that the villagers used traditional medicine for the treatment of illness, including chronic illnesses because the source of medicine is still available in the forest:

"Ada juga lah sikit-sikit, sesetengah orang kampung tu ambil ubat kampung. Buat masa sekarang saya memang dengan doktor sahaja." (S, 32 years old)
[There are also some of the villagers who are still using traditional medicine. As for me, I only go to see the doctor. (S, 32 years old)]

"Kalau diorang yang ada kencing manis, darah tinggi ini, selalunya diorang makan ubat sendiri. Ubat kampung. Cari sendiri dari hutan dekat sini." (F, 35 years old)
[For those having diabetes and high BP, they usually eat their own medication. Traditional medication. They will find the roots of the woods from the nearby forest. (F, 35 years old)]

Some of the respondents used traditional massage and medication made from tree roots for the treatment of illness:

"Ada la sakit urat sendi ini dah dekat 10 tahun. Mengigit-gigit. Ada sakit sikit la. Kadang-kadang saya buat urut kampung. Ada kurang la sikit. Tak terus elok la." (J, 53 years old)
[I have been experiencing joint pains for the past ten years. It feels biting. I sometimes go for traditional massage that is available in this village to reduce the pain. I do not fully recover, but at least the pain improved after that. (J, 53 years old)]

"Saya suami saya tahu ubat kampung. Mula-mula tu dia cakap mula-mula saya kencing kotor pergi hospital pun tak mahu hilang-hilang. Suami saya cakap ambil akar kayu, rebus suruh minum. Lepas rebus saya minum terus kencing banyak. Haa hidup la saya, kata saya. Senang sampai sekarang takda lagi la saya." (SH, 52 years old)
[For me, it was my husband who knew about this traditional medicine. Last time I had "dirty urine". I went to the hospital but still did not recover. My husband asked me to take roots from the woods, and I boiled and drank. After that, I produced a lot of urine. I am so happy as I recovered. Until now I no longer have that problem. (SH, 52 years old)]

4.4.7.1 Summary of Theme 6

From the qualitative interview, the health-seeking behaviour of traditional medicine (Figure 4.28) can be summarised as for the treatment of chronic illness, some of them still practised traditional medication and from their experience, traditional medication helped them to recover from their illness.

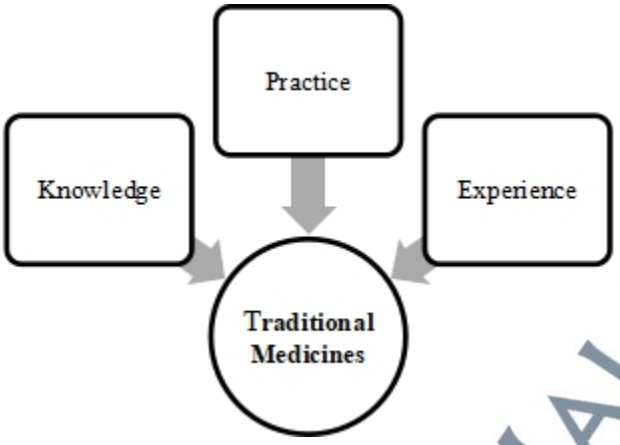

Figure 4.28: Summary of Theme 6 (Traditional medicine)

4.4.8 Summary Finding in Qualitative Phase Two

The qualitative findings of this study uncovered poor health literacy, knowledge deficit and unhealthy lifestyle behaviour among the respondents, and barriers to seeking medical treatment. The health behaviour of an individual could influence the risk of developing NCDs. For the respondents, their health behaviours were influenced by the determinants of lifestyle transition, knowledge of diseases, barriers towards modifiable NCDs risk behaviour, and the healthcare system, either modern or traditional.

With urbanisation, the Orang Asli in this village underwent a great deal of modernisation. They were provided with various facilities and economical sources to elevate their socioeconomic status. However, modernisation also affected their health as they became accustomed to unhealthy behavioural risk factors of NCDs. Faced with inadequate knowledge of NCDs and barriers to a healthy lifestyle, their risks of developing NCDs increased. Some of the respondents also claimed that they faced certain barriers in receiving modern treatment. Furthermore, there were some

conflicting opinions between traditional and modern medicines as the treatment of choice for NCDs.

4.5 Methodological Triangulation

Following mixed-methods protocol, the two data sets integrated to explain cohesively those aspects of the qualitative research that converged with and might influence, elements of the quantitative data. These factors intersected or converged with the results identified in the quantitative analysis.

The themes emerged from the qualitative interview to answer the major theme of the study research about risks and health behaviour towards NCDs among the Orang Asli. The themes that emerged from the qualitative study were compared to the results from the quantitative study to identify the degree of similarity and interconnectedness.

1) Development and life transition

The villagers of Kampung Orang Asli Ulu Kelaka were either replacement from their previous placement or married to local villagers. This village located near the suburban area. Thus, prevalence to NCDs is expected to increase for the community as this population urbanisation which directly exposed them to urbanised lifestyle.

In the qualitative findings, the transition from their old villages to the new village generated a better living condition for the Orang Asli. They underwent life transformation and their living condition became more comfortable compared to previous years. The factors contributing to this included the housing, environment, the facility provided, and economical activity to generate income.

2) Knowledge and perception of NCDs

Even though some of the respondents had a knowledge on NCDs, the knowledge was general. From the qualitative findings, there is evidence that high blood pressure, Diabetes mellitus and obesity are among the diseases affecting the villagers. This finding was supported by the quantitative phase as shown in Figure 4.7. The highest number of NCDs are self-reported hypertension, followed by hypercholesterolemia and Diabetes mellitus with 14.8%, 5.2% and 4.3%, respectively. For obesity indicators, 59.4% were having obese BMI and 59.7% had abdominal obesity.

3) Health effects of NCDs Risk Factors

Knowledge about NCDs and healthy lifestyle-practice was poor. Even though they knew the modifiable risk behaviours that could cause deterioration to health, many of them only had general knowledge. They lacked specific knowledge about the effect of unhealthy behaviour to health. This is similar to the findings of the quantitative component of knowledge towards NCDs in subheading 4.4.3.

4) Barriers to preventing NCDS Risk Factors

To develop the strategies aimed at reducing behavioural risk factors towards NCDs, the factors that influenced this unhealthy lifestyle practice among villagers must be identified. Smoking and alcohol consumption were influenced by socialisation, desire, and stress. Lack of physical facility and time constraints were the main barriers in conducting physical activities. Furthermore, the limited availability of vegetables and fruits, transportation, and financial constraint also resulted in low fibre intake among the villagers. This finding was confirmed by the survey results, which

showed 51.1% and 80.6% of the respondents having poor attitude and practices towards NCDs.

5) Utilisation of Modern medicines

As there was good access to modern medicine, many villagers preferred to used the healthcare facilities provided to treat their illnesses. This is in line to the findings of the quantitative component of health-seeking behaviour (Figure 4.20) and accessibility to public healthcare facility (Table 4.18 and Table 4.19). However, few barrier among individuals diagnosed with NCDs still needed to be addressed, including transportation, dependency, distance, and non-compliance.

6) **Traditional Medicines**

Some of the villagers relied solely on modern medicines. However, as validated in quantitative finding, 40.7% of respondents rely on both traditional and modern treatments. Since they still have some knowledge of traditional medicine and the source of traditional medicine was still available in the nearby forest, many villagers were still practising traditional medicine at the time of the study. They even treated their chronic diseases with traditional medicines.

4.6 Summary of the Chapter Four

Finding from systematic review provided an evidence-based background for the direction of the research. The prevalence of the behavioural and metabolic risk factors of NCDs is high among the Orang Asli population. However, data remain scarce with only a low number of studies. Furthermore, the studies were of low methodological quality with a wide variation in the definitions used for risk measure.

However, by conducting this systematic review, a better understanding of the latest scenario was obtain to support further work on answering the research questions.

Then, finding from the mixed-method that includes an explanatory sequential survey of risks and health behaviour among Proto-Malay Orang Asli living in Jelebu, Negeri Sembilan was presented. The quantitative findings provide the risk status and associated factor to major NCDs and health behaviour among the adults' Orang Asli. Then, results show the low level of KAP towards NCDs among them. Next, the study found that many of the Orang Asli seeking modern treatment when sick.

Findings from the qualitative phase indicated that negative beliefs, behaviours and attitudes that are likely to be harmful to long-term health and good quality of life among them. Even many respondents using the modern healthcare facility, barriers to seeking medical treatment are significant, which require more investigation. The next chapter discusses the integration of the data sets of the systematic review, quantitative finding and qualitative information.