10. Blood Cholesterol

Risk of CHD is directly related to blood cholesterol levels. Blood cholesterol levels can be reduced by drugs, physical activity and by dietary changes, in particular a reduction in the consumption of saturated fat.

Recent research from the World Health Organization highlights the importance of raised blood cholesterol as a risk factor for CHD. The World Health Report 2002 estimates that around 8% of all disease burden in developed countries is caused by raised blood cholesterol, and that over 50% of CHD in developed countries is due to blood cholesterol levels in excess of the theoretical minimum (3.8 mmol/l)[1].

Different guidelines give slightly different advice for managing high levels of blood cholesterol (hyperlipidaemia). The National Service Framework for coronary heart disease includes guidelines on the prevention of coronary heart disease in clinical practice and suggests a cholesterol target of less than 5.0 mmol/l for both primary and secondary prevention[2].

High-density lipoprotein cholesterol (HDL-cholesterol) is the fraction of cholesterol that removes cholesterol (via the liver) from the blood. Low levels of HDL-cholesterol are associated with an increased risk of CHD and a worse prognosis after a heart attack. Guidelines on HDL-cholesterol generally recommend treatment for those with concentrations below 1.0 mmol/l[3].

Overall levels

The mean blood cholesterol level for men aged 16 and above in England is 5.5 mmol/l and for women 5.6 mmol/l. About 66% of men and 67% of women have blood cholesterol levels of 5.0 mmol/l and above (Table 10.1).

The mean HDL-cholesterol level for men aged 16 and above in England is 1.3 mmol/l and for women 1.6 mmol/l. About 17% of men and 5% of women have HDL-cholesterol levels of less than 1.0 mmol/l (Table 10.2).

Age and sex differences

The prevalence of raised cholesterol increases with age in both men and women. In men the proportion with cholesterol levels of 5.0 mmol/l and above increases from 23% in those aged 16-24 to 82% in those aged 55-64, with a slight decrease in the two oldest age groups. In women cholesterol levels of 5.0 mmol/l or above continue to increase from those aged 16-24 (27%) to those aged 65-74 (91%), with a slight decrease in the over 75 years age group (Table and Fig 10.1).

The prevalence of low HDL-cholesterol shows smaller age-related variation, with no clear pattern. The proportion with HDL-cholesterol levels of less than 1.0 mmol/l ranges from 13% in those aged 16-24 years to 19% in those aged 65-74 years in men, and from 4% in those aged 16-24 years to 7% of those aged 65-74 in women (Table 10.2).

Rates of low HDL-cholesterol are much higher in men than women - around three to four times as high in all age groups (Table 10.2).

Temporal trends

Mean blood cholesterol level in 1998 was lower than in 1994 for all age groups in both men and women, with overall levels in adults falling from 5.8mmol/l to 5.5 mmol/l in men and from 6.0 mmol/l to 5.6 mmol/l in women[4]. However, these falls should be interpreted with caution as the laboratory processing blood analytes in 1998 was different from that used in 1994[5].

Socio-economic differences

Total blood cholesterol levels show little social class variation in either sex (Table 10.3). However, low HDL-cholesterol levels do vary with income, most notably in women (Table 10.4). Those with higher incomes are less likely to have levels of HDL-cholesterol below 1.0 mmol/l (Table 10.4).

Ethnic differences

Mean total cholesterol and the prevalence of blood cholesterol levels of 5.0 mmol/l and above, are marginally lower in all ethnic minority groups than the general population (Table 10.5).

Ethnic variations in the prevalence of low HDL-cholesterol are considerable, with the highest rates for both sexes found in the Pakistani and Bangladeshi communities. Nearly half (45%) of Bangladeshi men have an HDL-cholesterol level of less than 1.0 mmol/l compared to around one in six (17%) men in the general population. In contrast Black Caribbean men and women have a relatively low prevalence of low HDL-cholesterol (Table 10.6).

International differences

Total blood cholesterol levels in the UK are high by international standards, particularly in women. For example, data from the World Health Organization MONICA Project show that mean blood cholesterol levels in Beijing, China are about 4.5 mmol/l for men and women aged 35-64; and only 20% of men aged 35-64 and 19% of women have levels above 5.2 mmol/l (Table 10.7 and Figure 10.7).

Trend data from the MONICA Project show that between the mid-1980's and mid-1990's around half of the populations included in the study experienced a decline in average blood cholesterol levels. Compared to other cities in the study, declines in average blood cholesterol level were above average in Glasgow and Belfast, where significant declines occurred in both men and women[6].

Public health targets

There are no blood cholesterol targets for England, Wales, Scotland or Northern Ireland.

1. *World Health Organization (2002) The World Health Report 2002. Reducing Risks, Promoting Healthy Life. World Health Organization: Geneva.*
2. *Department of Health (2000) National Service Framework for Coronary Heart Disease. DH: London.*
3. *See p251: Joint Health Surveys Unit (2001) Health Survey for England. The Health of Ethnic Minority Groups 1999. The Stationery Office: London.*
4. *For 1994 Health Survey for England blood cholesterol by sex and age data see www.heartstats.org/bloodcholesterol*
5. *These falls are mirrored in the MONICA trend data reported for Glasgow and Belfast (see section on International differences below), supporting a positive interpretation of the Health Survey for England trend data.*
6. *WHO MONICA Project (2003) Monica monograph and multimedia sourcebook. Edited by Hugh Tunstall-Pedoe for the WHO MONICA Project. WHO: Geneva.*

Table 10.1 Total cholesterol by sex and age, 1998, England

	All ages	16-24	25-34	35-44	45-54	55-64	65-74	75 and over
Total serum cholesterol (mmol/l)	%	%	%	%	%	%	%	%
MEN								
Mean	5.5	4.4	5.1	5.5	5.8	5.8	5.8	5.5
% ≥ 5.0	66.3	22.5	50.0	69.9	77.9	81.9	77.6	71.6
Base	*4,874*	*423*	*910*	*960*	*937*	*673*	*584*	*387*
WOMEN								
Mean	5.6	4.6	4.9	5.2	5.7	6.2	6.5	6.3
% ≥ 5.0	67.1	27.1	43.8	58.7	73.6	88.5	91.4	89.2
Base	*5,458*	*450*	*967*	*1,067*	*1,080*	*764*	*594*	*536*

Adults aged 16 and over.

Source: Health Survey for England 1998, personal communication.

Fig 10.1 Percentage of adults with blood cholesterol levels ≥ 5.2 mmol/l, 1998, England

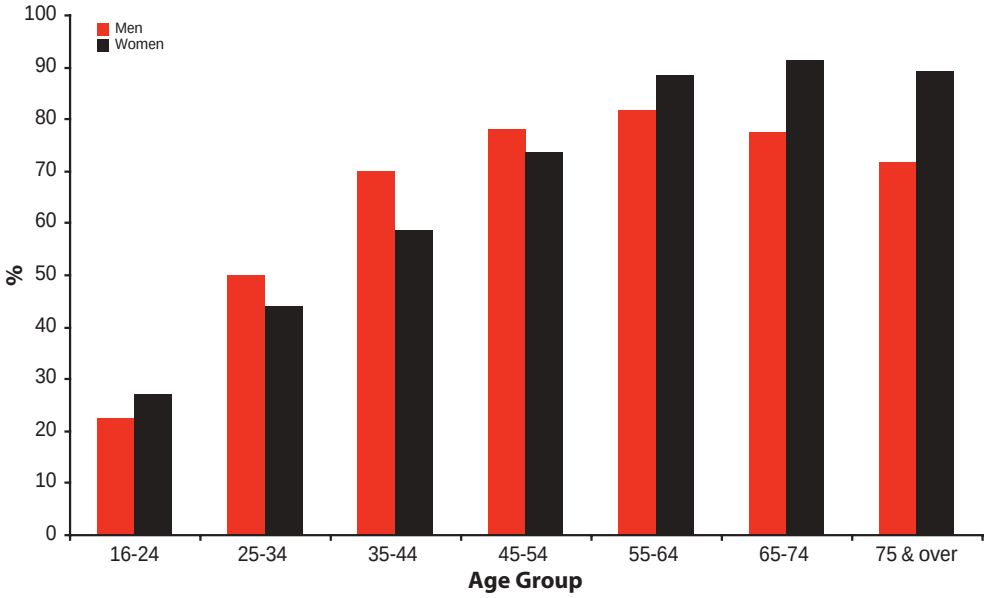

Table 10.2 Low HDL cholesterol by sex and age, 1998, England

	All ages	16-24	25-34	35-44	45-54	55-64	65-74	75 and over
Total HDL cholesterol (mmol/l)	%	%	%	%	%	%	%	%
MEN								
Mean	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
% < 1.0	16.9	13.0	16.8	16.2	17.3	19.0	19.2	14.7
Base	*4,862*	*422*	*907*	*958*	*935*	*670*	*583*	*387*
WOMEN								
Mean	1.6	1.5	1.5	1.5	1.6	1.6	1.5	1.6
% < 1.0	5.4	4.2	6.1	5.5	5.4	5.2	6.9	3.5
Base	*5,442*	*450*	*963*	*1,063*	*1,077*	*762*	*591*	*536*

Adults aged 16 and over.

Source: Joint Health Surveys Unit (2000) Health Survey for England 1998. The Stationery Office: London.

Table 10.3 Total cholesterol by sex and social class, 1998, England

	Social class of head of household					
	I	II	IIINM	IIIM	IV	V
Total serum cholesterol (mmol/l)	%	%	%	%	%	%
MEN						
Mean	5.4	5.4	5.5	5.4	5.3	5.5
% ≥ 5.0	58.9	62.3	63.6	63.9	60.9	61.6
Base	*338*	*1,539*	*470*	*1,540*	*694*	*210*
WOMEN						
Mean	5.6	5.6	5.5	5.6	5.6	5.6
% ≥ 5.0	60.6	65.6	64.4	65.2	66.5	64.1
Base	*323*	*1,610*	*836*	*1,420*	*831*	*293*

Adults aged 16 and over.

Age-standardised percentages.

Source: Health Survey for England 1998, personal communication.

Table 10.4 Low HDL cholesterol by sex and equivalised household income, 1998, England

	Equivalised household income quintile				
	Up to £7,186	**£7,187 to £10,834**	**£10,835 to £17,890**	**£17,891 to £27,705**	**Over £27,705**
Total HDL cholesterol (mmol/l)	**%**	**%**	**%**	**%**	**%**
MEN					
Mean	1.2	1.3	1.3	1.3	1.3
% < 1.0	19.2	19.0	19.6	14.8	14.9
Base	*610*	*664*	*1,018*	*993*	*999*
WOMEN					
Mean	1.5	1.5	1.6	1.6	1.7
% < 1.0	7.9	7.8	6.3	4.2	2.9
Base	*816*	*910*	*1,113*	*993*	*919*

Adults aged 16 and over.

Age-standardised percentages. For method of standardisation see source.

Source: Joint Health Surveys Unit (2000) Health Survey for England 1998. The Stationery Office: London.

Table 10.5 Total cholesterol by sex and ethnic group, 1999, England

	General population	**Black Caribbean**	**Indian**	**Pakistani**	**Bangladeshi**	**Chinese**	**Irish**
Total serum cholesterol (mmol/l)	**%**	**%**	**%**	**%**	**%**	**%**	**%**
MEN							
Mean	5.2	5.5	5.2	5.3	5.2	5.4	5.5
% ≥ 5.0	56.4	65.6	57.0	59.7	53.7	65.0	66.3
Base	*285*	*379*	*301*	*198*	*149*	*326*	*4,874*
WOMEN							
Mean	5.2	5.3	5.3	5.3	5.3	5.5	5.6
% ≥ 5.0	51.7	57.7	56.4	53.0	53.0	62.4	67.1
Base	*368*	*376*	*281*	*176*	*175*	*439*	*5,458*

Adults aged 16 and over.

Age-standardised percentages (standardised risk ratios x prevalence in general population).

Source: Joint Health Surveys Unit (2000) Health Survey for England. The Health of Minority Ethnic Groups 1999. The Stationery Office: London.

Table 10.6 Low HDL cholesterol by sex and ethnic group, 1999, England

Total HDL cholesterol (mmol/l)	General population	Black Caribbean	Indian	Pakistani	Bangladeshi	Chinese	Irish
	%	%	%	%	%	%	%
MEN							
Mean	1.5	1.3	1.1	1.1	1.3	1.3	1.3
% < 1.0	10.3	18.8	28.2	45.3	13.5	18.6	16.9
Base	*285*	*379*	*301*	*198*	*149*	*326*	*4,874*
WOMEN							
Mean	1.6	1.5	1.4	1.3	1.6	1.6	1.6
% < 1.0	3.1	8.7	12.9	19.8	4.5	5.5	5.4
Base	*368*	*376*	*281*	*176*	*175*	*439*	*5,458*

Adults aged 16 and over.

Age-standardised percentages (standardised risk ratios x prevalence in general population).

Source: Joint Health Surveys Unit (2000) Health Survey for England. The Health of Minority Ethnic Groups 1999. The Stationery Office: London.

Table 10.7 Blood cholesterol levels, adults aged 35-64, by sex, latest available data, MONICA Project populations

Total cholesterol (mmol/l)			MEN			WOMEN		
			5.2 - <7.8 %	≥7.8 %	Mean mmol/l	5.2 - <7.8 %	≥7.8 %	Mean mmol/l
MONICA population	MONICA population code	Year of survey						
Australia-Newcastle	AUS-NEW	1994	68	3	5.8	61	3	5.6
Australia-Perth	AUS-PER	1994	65	2	5.5	53	1	5.4
Belgium-Charleroi	BEL-CHA	1990/93	68	9	6.2	67	10	6.1
Belgium-Ghent	BEL-GHE	1990/92	70	6	6.0	66	6	6.0
Canada-Halifax County	CAN-HAL	1995	68	1	5.6	65	5	5.8
China-Beijing	CHN-BEI	1993	20	0	4.5	19	0	4.5
Czech Republic	CZE-CZE	1992	69	11	6.2	67	11	6.1
Denmark-Glostrup	DEN-GLO	1991/92	72	5	6.0	65	5	5.8
Finland-Kuopio Province	FIN-KUO	1992	70	7	6.0	66	5	5.8
Finland-North Karelia	FIN-NKA	1992	74	7	6.0	65	4	5.7
Finland-Turku/Loimaa	FIN-TUL	1992	71	4	5.9	62	5	5.7
France-Lille	FRA-LIL	1995/96	72	4	5.8	68	5	5.8
France-Strasbourg	FRA-STR	1995/97	76	5	6.0	70	5	5.9
France-Toulouse	FRA-TOU	1994/96	70	4	5.8	66	2	5.6
Germany-Augsburg (rural)	GER-AUR	1994/95	72	6	6.1	69	5	5.9
Germany-Augsburg (urban)	GER-AUU	1994/95	71	10	6.2	68	6	5.9
Germany-Bremen	GER-BRE	1991/92	74	9	6.2	76	8	6.2
Germany-East Germany	GER-EGE	1993/94	69	4	5.8	64	5	5.8
Iceland	ICE-ICE	1993/94	70	10	6.2	67	6	6.0
Italy-Area Brianza	ITA-BRI	1993/94	69	6	5.9	70	5	5.9
Italy-Friuli	ITA-FRI	1994	65	5	5.9	60	3	5.7
Lithuania-Kaunas	LTU-KAU	1992/93	68	7	6.0	62	14	6.2
New Zealand	NEZ-AUC	1993/94	67	3	5.7	58	4	5.6
Poland-Tarnobrzeg Voivodship	POL-TAR	1992/93	63	2	5.6	59	1	5.5
Poland-Warsaw	POL-WAR	1993	67	3	5.7	62	4	5.6
Russia-Moscow (control)	RUS-MOC	1992/95	47	2	5.3	53	5	5.6
Russia-Novosibirsk (control)	RUS-NOC	1995	40	1	5.0	49	2	5.3
Spain-Catalonia	SPA-CAT	1994/96	63	3	5.6	61	2	5.5
Sweden-Gothenburg	SWE-GOT	1994/96	52	5	5.6	48	3	5.4
Sweden-Northern Sweden	SWE-NSW	1994	71	11	6.3	66	11	6.1
Switzerland-Ticino	SWI-TIC	1992/93	74	15	6.5	70	10	6.2
Switzerland-Vaud/Fribourg	SWI-VAF	1992/93	75	10	6.3	69	8	6.1
United Kingdom-Belfast	UNK-BEL	1991/92	71	6	5.9	63	8	5.9
United Kingdom-Glasgow	UNK-GLA	1995	72	6	6.1	69	8	6.1
United States-Stanford	USA-STA	1989/90	53	2	5.4	48	2	5.3
Yugoslavia-Novi Sad	YUG-NOS	1994/95	69	13	6.4	70	9	6.2

Age-standardised levels; consult WHO MONICA Project for details of measurement and age-standardisation.

Source: *WHO MONICA Project database, personal communication.*

Fig 10.7 Percentage of adults aged 35-64 with blood cholesterol levels ≥7.8 mmol/l, latest available data, MONICA Project populations