

Seroprevalence and Shifting Endemicities of Hepatitis A Virus Infection in Two Different Geographical Areas in Philippines

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Inclusion criteria

1. Between 1–80 years of age.
2. Willing to participate and provide informed consent (and attestation for minors according to local good research practices) by participant or parent and/ or legal guardian for children.
3. Being resident (living during the last 6 months) in the selected geographic area.

Exclusion criteria

1. Children in care.
2. Receipt of immune globulins, blood or blood-derived products in last 3 months.
3. Bleeding disorder, or receipt of anticoagulants in the 3 weeks preceding inclusion, contraindicating blood drawing.
4. Attending to a health care institution due to gastrointestinal symptoms or icterical in the last 8 weeks.
5. Individuals diagnosed immunodeficiency condition.
6. Individuals diagnosed with terminal or psychiatric illness.
7. Child, parent or other family member living the same household already enrolled as participant in this study.

Table S1 **Cities included in the recruitment/enrollment process for participants from urban regions**

City
Antipolo
Bulacan
Caloocan City
Cavite City
Makati City
Malabon City
Mandaluyong City
Montalban
Navotas City
Pasig City
Quezon City
San Juan City
Tanay

Table S2 **Theoretical sample size by age group**

Age group, in years	Expected HAV seroprevalence prevalence	Sample size needed n=	Safe margin of error n=
1–2	0.1	50	55
3–4	0.1	25	55
5-9	0.2	44	50
10–14	0.2	44	50
15–19	0.4	65	70
20–24	0.5	68	75
25–29	0.5	68	75
30–34	0.7	57	65

35–39	0.7	57	65
40–49	0.8	44	50
50+	0.9	25	30
Total		572	640

HAV: hepatitis A virus

Table S3 Comparison of past medical history factors between urban and rural areas

Past medical history of hepatitis	Urban N (%)	Rural N (%)	p-value
Ever diagnosed with hepatitis disease			
Yes	8 (1.3)	5 (0.8)	0.6332*
No	587 (97.5)	628 (98.1)	
Don't know	7 (1.2)	7 (1.1)	
Type of hepatitis disease			
Hepatitis A	1	-	NA
Hepatitis B	4	1	
No response/Don't know	3	4	
Living in the same household as today			
Yes	2	1	NA
No	3	1	
No response	3	3	
Area of residence of the household when one got infected			
Urban	5	1	NA
Rural	-	1	
Lived the most during first 5 years in current area			
Yes	506 (84.0)	596 (93.1)	<0.0001*
No	96 (16.0)	36 (5.6)	

Past medical history of hepatitis	Urban N (%)	Rural N (%)	p-value
No answer	-	8 (1.3%)	
Area of residence at that time			
Urban	568 (94.4)	6 (0.9)	NA
Rural	34 (5.6)	626 (97.8)	
No response	-	8 (1.3%)	
Family with jaundice and fever in the past			
Yes	21 (3.5)	10 (1.6)	0.0300*
No	581 (96.5)	629 (98.3)	
No response		1 (0.1%)	
Family member affected			
Husband	-	1	NA
Father	7	-	
Mother	2	-	
Sibling	6	6	
Grandfather	1	-	
Grandmother	1	-	
Aunt	1	-	
Cousin	2	-	
Nephew	1	-	
Unspecified	-	3	
Vaccinated against hepatitis A			
Yes	102 (16.9)	2 (0.3)	<0.0001*
No	500 (83.1)	638 (99.7)	
Confirmed vaccinated by checking vaccination card			
Yes	25 (24.5)	1 (50.0)	0.8786 †

Past medical history of hepatitis	Urban N (%)	Rural N (%)	p-value
No	77 (75.5)	1 (50.0)	

NA: not applicable

*Chi square test

† Fishers exact test

Table S4 Comparison of water safety access factors between urban and rural areas

Features of water safety access	Urban N (%)	Rural N (%)	p-value
Main source of drinking water for household members			
Piped water into dwelling	109 (18.1)	38 (5.9)	
Piped water to yard/plot	-	14 (2.2)	
Public tap/standpipe	3 (0.5)	69 (10.8)	
Tubewell/bore-hole	-	197 (30.8)	
Protected dug well	-	62 (9.7)	
Unprotected dug well	-	2 (0.3)	
Protected spring	-	20 (3.1)	
Unprotected spring	-	15 (2.3)	
Bottled water	489 (81.2)	220 (34.4)	
Surface water (river, dam, lake, pond, stream, canal, irrigation channels)	-	3 (0.5)	
Other, unspecified	1 (0.2)	-	
Main source of drinking water for household members			
Improved	601 (100)	620 (96.9)	<0.0001*
Unimproved	0	20 (3.1)	
Main source of water used by household for other purposes (if bottled water was the main source of drinking water)			

Features of water safety access	Urban N (%)	Rural N (%)	p-value
Piped water into dwelling	478 (97.8)	54 (24.7)	
Piped water to yard/plot	1 (0.2)	3 (1.4)	
Public tap/standpipe	2 (0.4)	33 (15.1)	
Tube well/bore-hole	-	95 (43.4)	
Protected dug well	3 (0.6)	27 (12.3)	
Protected spring	-	3 (1.4)	
Unprotected spring	-	1 (0.5)	
Bottled water	5 (1.0)	1 (0.5)	
Surface water	-	2 (0.9)	
Main source of water used by household for other purposes (if bottled water was main source of drinking water)			
Improved	489 (100)	216 (98.6)	0.0094 [‡]
Unimproved	-	3 (1.4)	
Length of time to get water and come back in minutes; mean (SD)	0.3 (1.5)	7.2 (14.3)	<0.0001 [†]
Treat water			
Yes	178 (29.6)	268 (41.9)	<0.0001*
No	424 (70.4)	372 (58.1)	
Safe drinking water practices			
Boil	110 (61.8)	197 (73.8)	
Add bleach/chlorine	-	-	
Strain it through a cloth	7 (3.9)	49 (18.3)	
Use a water filter (ceramic, sand, composite, etc.)	66 (37.1)	4 (1.5)	
Solar disinfection	1 (0.6)	2 (0.8)	
Let it stand and settle	2 (1.1)	70 (26.1)	
Other (cooling, water purification tablets)	2 (1.1)	-	

Features of water safety access	Urban N (%)	Rural N (%)	p-value
Don't know	1 (0.6)	-	
Type of toilet facility			
Flush	208 (34.6)	20 (3.1)	<0.0001*
Pour-flush	394 (65.4)	619 (96.9)	
No toilet		1	
Where does it flush/pour-flush?			
Piped water system	78 (13.0)	-	
Septic tank	497 (82.6)	592 (92.8)	
Elsewhere	1 (0.2)	-	
Unknown place/not sure	24 (3.9)	-	
Ventilated improve out latrine	-	2 (0.3)	
Pit latrine with slab (/closed pit)	-	2 (0.3)	
Pit latrine without slab/open pit	-	1 (0.2)	
No facilities or bush or field (river)	2 (0.3)	7 (1.1)	
Other (sewage canal, drainage canal, open canal, common/ common drainage, dug hole, household sewage tank)	-	35 (5.5)	
No response	-	2	
Where does it flush/pour?			
Improved	600 (99.7)	602 (94.4)	<0.0001*
Unimproved	2 (0.3)	36 (5.6)	

SD: standard deviation

* Chi square test

‡ Fishers exact test

† Independent t-test

Table S5 Comparison of hygienic food intake factors between urban and rural areas

Hygiene food intake practices	Urban N (%)	Rural N (%)	p-value*
Where food is prepared at home			
On the ground	10 (1.7)	49 (7.7)	<0.0001
Multi-purpose table	119 (19.8)	303 (47.3)	
Table exclusively set for cooking	473 (78.5)	288 (45.0)	
Get main meals from home			
Never	14 (2.3)	2 (0.3)	0.0002
Sometimes	92 (15.3)	123 (19.2)	
Most of the time	261 (43.4)	229 (35.8)	
Always	235 (39.0)	286 (44.7)	
Get main meals from street			
Never	135 (22.4)	94 (14.7)	0.0020
Sometimes	379 (63.0)	445 (69.5)	
Most of the time	66 (11.0)	85 (13.3)	
Always	22 (3.6)	16 (2.5)	
Wash hands before handling food			
Never	1 (0.2)	3 (0.5)	<0.0001
Sometimes	18 (3.0)	55 (8.6)	
Most of the time	68 (11.3)	144 (22.5)	
Always	515 (85.5)	438 (68.4)	
Wash hands before eating food			
Never	3 (0.5)	2 (0.3)	0.0009
Sometimes	17 (2.8)	29 (4.5)	
Most of the time	73 (12.1)	122 (19.1)	
Always	509 (84.6)	487 (76.1)	

Hygiene food intake practices	Urban N (%)	Rural N (%)	p-value*
Wash hands after defecation			
Never	-	-	0.0198
Sometimes	4 (0.7)	3 (0.5)	
Most of the time	32 (5.3)	58 (9.1)	
Always	566 (94.0)	579 (90.5)	
Kitchen where food was prepared free of insects and rodents			
Never	65 (10.8)	66 (10.3)	<0.0001
Sometimes	127 (21.1)	290 (45.4)	
Most of the time	216 (35.9)	171 (26.8)	
Always	194 (32.2)	112 (17.5)	

* Chi square test

Table S6 Comparison of knowledge factors on HAV disease between urban and rural areas

Attributes of knowledge	Urban N (%)	Rural N (%)	p-value*
Have heard about the disease			
Yes	485 (80.6)	294 (45.9)	<0.0001
No	117 (19.4)	346 (54.1)	
Kind of disease			
Communicable	275 (56.7)	130 (44.2)	0.0033
Non-communicable	116 (23.9)	91 (31.0)	
Do not know	94 (19.4)	73 (24.8)	
Main way of transmission			
By blood	86 (17.9)	43 (14.7)	0.6718
By air	14 (2.9)	12 (4.1)	

Attributes of knowledge	Urban N (%)	Rural N (%)	p-value*
Sexually transmitted	19 (4.0)	12 (4.1)	
By contaminated food/water	350 (72.9)	216 (74.0)	
By mosquito bites	11 (2.3)	9 (3.1)	
Vaccine to prevent hepatitis A available in the Philippines			
Yes	219 (45.2)	136 (46.3)	0.0032
No	75 (15.4)	70 (23.8)	
Do not know	191 (39.4)	88 (29.9)	
Possible risk factor/s			
Use unclean toilets	300 (61.9)	224 (76.2)	<0.0001
Consume contaminated water/food	446 (92.0)	281 (95.6)	0.0498
Taking to ill	180 (37.1)	142 (48.3)	0.0021
Sharing a room with an infected individual	217 (44.7)	144 (49.0)	0.2511
Possible symptoms of hepatitis A			
Yellowish discoloration of the eyes			0.7603
Yes	455 (93.8)	272 (92.5)	
No	20 (4.1)	14 (4.8)	
Don't know	10 (2.1)	8 (2.7)	
Abdominal pain			<0.0001
Yes	384 (79.2)	184 (62.6)	
No	51 (10.5)	59 (20.1)	
Don't know	50 (10.3)	51 (17.3)	
Nasal bleeding			0.2883
Yes	126 (26.0)	73 (24.8)	
No	196 (40.4)	135 (45.9)	
Don't know	163 (33.6)	86 (29.3)	

Attributes of knowledge	Urban N (%)	Rural N (%)	p-value*
Dark tea color urine			0.0031
Yes	302 (62.3)	155 (52.7)	
No	76 (15.7)	74 (25.2)	
Don't know	107 (22.1)	65 (22.1)	
Numbness over the extremities			<0.0001
Yes	119 (24.5)	124 (42.2)	
No	175 (36.1)	82 (27.9)	
Don't know	191 (39.4)	88 (29.9)	
Fever			0.5130
Yes	406 (83.7)	255 (86.7)	
No	46 (9.5)	22 (7.5)	
Don't know	33 (6.8)	17 (5.8)	
Pale stools			0.6753
Yes	215 (44.3)	127 (43.2)	
No	104 (21.4)	71 (24.2)	
Don't know	166 (34.2)	96 (32.6)	

HAV: hepatitis A virus

* Chi square test

Questionnaire

Section A. Sociodemographics

Please use a circle to mark the answer given by the participant/parent

A1	Education of 12+ participant: 1. Primary School (6years) 2. Middle School (9 years) 3. High School (13 years) 4. Graduate/post-graduate (16+ years) 5. Illiterate 6. <6y (for participants <12y age)
A2	Occupation of participant: 1. Professional 2. Semi-professional 3. Clerical/shop owner 4. Skilled worker 5. Semi-skilled worker 6. Unskilled worker 7. Household duties 8. Unemployed (adults) 9. Attending School 10. Attending Garderie/Pre-School 11. At home (children)
A3	For all participants, What was the highest education attained from you parents of parents choose the option number as mentioned in A1 (a) Education of Father: 1- 2- 3- 4- 5- 6- (b) Education of Mother: 1- 2- 3- 4- 5- 6-
A4	Total number of family members living in the same household: _____
A5	<i>Total family monthly income _____ (local currency, please consider to include multiple selection accordingly to local scenario:</i>
A6	Regarding your households walls roof and floor are made of (please choose one) <input type="radio"/> Permanent building materials are used for walls, roof and floor <input type="radio"/> Natural/Traditional/ Rudimentary materials
A7	Do you have at home (you can tick more than one option) <input type="radio"/> Fridge/Refrigerator <input type="radio"/> Bank account <input type="radio"/> Iron <input type="radio"/> Desktop/laptop <input type="radio"/> Radio <input type="radio"/> Sofa <input type="radio"/> Sewing machine
A8	How many habitable rooms your household has? _____

Section B. Knowledge of disease

(Participants 14+ **should answer by themselves** these Section of question in not otherwise specified)

B1	Have you heard about a disease called Hepatitis A before? (If the answer is "No" then go to the Section C)	1. Yes	2. No
B2	What kind of a disease is it?	1.Communicable 2.Non-Communicable 3. Do not know	
B3	What is the main way of transmission?	1. By blood 2. By air 3. Sexually Transmitted 4. By contaminated food/water 5. By mosquito bite	
B4	Is there a vaccine to prevent Hepatitis A available in _____(Name of country)_____?	1. Yes	2. No 3. Do not know
B5	What are the possible risk factor/ factors? (Multiple answers are allowed)	<input type="radio"/> Use unclean toilets <input type="radio"/> Consume contaminated water/ food <input type="radio"/> Talking to ill <input type="radio"/> Sharing a room with an infected individual	
B6	_____What are the possible symptoms of Hepatitis A?		
	a. Yellowish discoloration of eyes	Yes	No
	b. Abdominal pain	Yes	No
	c. Nasal bleeding	Yes	No
	d. Dark tea colour urine	Yes	No
	e. Numbness over extremities	Yes	No
	f. Fever	Yes	No
	g. Pale stools	Yes	No

Section C. Past Medical History of Hepatitis

(participants 14+ can answer this section questions with the assistance of their guardian)

C1	Have you (your child) ever been diagnosed with Hepatitis Disease? 1. Yes 2. No 3. DK
C1a	(a) If Yes, what type? _____, if No go to Question C2 (Write the answer provided, if the answer is Don't Know, write down DK)
C1b	(b) if Yes, were you living in the same household as today? 1. Yes 2. No
C1c	(c) if No to the last question, where were you living? (Village Name) _____
C1d	(d) What was the Area of Residence of your household when got infected? 1. Urban 2. Rural
C2a	(a) Did you (your child) live the most during your first 5 years of life in the current village? 1. Yes 2. No
C2b	(b) What was the Area of Residence of your household at that time: 1. Urban 2. Rural
C3a	Has anyone in your family got jaundice with fever in the past? 1. Yes 2. No
C3b	(a) If yes, who? _____ (mother /father/siblings /others (specify)) (b) When (at least the year of occurrence. If more than one member affected record the earliest reported date)? MM/YEAR
C4a	Have you ever been vaccinated against Hepatitis A? 1. Yes 2. No
C4b	Confirm the answer by checking vaccination card?? 1. Yes 2. No

Section D . Drinking Water Safety

(participants 14+ can answer this section questions with the assistance of their guardian)

D1	<p>What is the main source of drinking-water for members of your household?</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">1. Piped water into dwelling</td> <td style="width: 33%;">6. Unprotected dug well</td> <td style="width: 33%;">11. Cart with small tank/drum</td> </tr> <tr> <td>2. Piped water to yard/plot</td> <td>7. Protected spring</td> <td>12. Tanker-truck</td> </tr> <tr> <td>3. Public tap/ standpipe</td> <td>8. Unprotected spring</td> <td>13. Surface water (river, dam, lake, pond, stream, canal, irrigation channels)</td> </tr> <tr> <td>4. Tubewell/ bore-hole</td> <td>9. Rainwater collection</td> <td></td> </tr> <tr> <td>5. Protected dug well</td> <td>10. Bottled water*</td> <td>14. Other (specify) _____</td> </tr> </table> <p>*If answer is #10 , go to the next question, otherwise your to #12</p>	1. Piped water into dwelling	6. Unprotected dug well	11. Cart with small tank/drum	2. Piped water to yard/plot	7. Protected spring	12. Tanker-truck	3. Public tap/ standpipe	8. Unprotected spring	13. Surface water (river, dam, lake, pond, stream, canal, irrigation channels)	4. Tubewell/ bore-hole	9. Rainwater collection		5. Protected dug well	10. Bottled water*	14. Other (specify) _____
1. Piped water into dwelling	6. Unprotected dug well	11. Cart with small tank/drum														
2. Piped water to yard/plot	7. Protected spring	12. Tanker-truck														
3. Public tap/ standpipe	8. Unprotected spring	13. Surface water (river, dam, lake, pond, stream, canal, irrigation channels)														
4. Tubewell/ bore-hole	9. Rainwater collection															
5. Protected dug well	10. Bottled water*	14. Other (specify) _____														
D2	<p>You indicated that bottled water was your main source of drinking water, now I will like to ask you what is the main source of water used by your household for other purposes, such as cooking and hand washing?</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">1. Piped water into dwelling</td> <td style="width: 33%;">6. Unprotected dug well</td> <td style="width: 33%;">11. Cart with small tank/drum</td> </tr> <tr> <td></td> <td>7. Protected spring</td> <td>12. Tanker-truck</td> </tr> </table>	1. Piped water into dwelling	6. Unprotected dug well	11. Cart with small tank/drum		7. Protected spring	12. Tanker-truck									
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	2. Piped water to yard/plot 3. Public tap/ standpipe 4. Tubewell/ bore-hole 5. Protected dug well	8. Unprotected spring 9. Rainwater collection 10. Bottled water	13. Surface water (river, dam, lake, pond, stream, canal, irrigation channels) 14. Other (specify) _____
D3	How long does it take to go there, get water, and come back? #. of minutes _____ , <i>(Ask for his/her best guess, otherwise please write down DK if participant don't know the answer to this question or 0 (zero) if water source is within the premises of the household)</i>		
D4	Do you treat your water in any way to make it safer to drink?		1. Yes 2. No
D5	What do you usually do to the water to make it safer to drink? Record all items mentioned		
	<ul style="list-style-type: none"> <input type="radio"/> Boil <input type="radio"/> Add bleach/chlorine <input type="radio"/> Strain it through a cloth <input type="radio"/> Use a water filter (ceramic, sand, composite, etc.) <input type="radio"/> Solar disinfection <input type="radio"/> Let it stand and settle <input type="radio"/> Other (specify) <input type="radio"/> Don't Know 		
D6	What kind of toilet facility do members of your household usually use? If "flush" or "pour flush" probe: Where does it Flush/pour flush to:		

Section E. HYGIENIC FOOD INTAKE

participants 14+ can answer this section questions with the assistance of their guardian

E1	Where do you prepare your food at home?	1. On the ground 2. multi-purpose table 3. Table exclusively set for cooking
E2	For the following question to be answer think on the last seven prior to this survey	
E3	Hand washing after defecation: 1. Yes 2. No <i>(practice of mother should be asked in case of younger children)</i>	

Please answer the following questions based on what you have done duringp the past 7 days

	Question:	Category			
		Never	Sometimes	Most of the time	Always
E4	Did you get your main meals from home?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E5	Did you get your main meals from street?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E6	Did you wash your hands before handling food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E7	Did you wash your hands before eating food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

E8	Did you wash your hands after defecation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E9	Was the kitchen which prepared the food you ate, free of insects and rodents?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
E10	Was the kitchen which prepared the food you ate, free of insects and rodents?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>