Research article

Risk assessment of waterborne infections in Enugu State, Nigeria: Implications of household water choices, knowledge, and practices

Onyekachi Juliet Okpasuo1,*, Ifeanyi Oscar Aguzie1, Anunobi Tochukwu Joy2 and Fabian C Okafor1,3

1 Parasitology and Public Health Research Laboratory, University of Nigeria, Nsukka, Nigeria
2 Science Laboratory Technology Department, Federal Polytechnic, Idah, Kogi State, Nigeria
3 Ecology and Environmental Biology, University of Nigeria, Nsukka, Nigeria

* Correspondence: Email: onyekachi.okpasuo@unn.edu.ng.

Supplementary

Table S1. Co-infections prevalence of waterborne etiological agents in Enugu Urban, Nigeria (number examined = 403).

| Coinfections                  | Number infected | Prevalence (%) |
|-------------------------------|-----------------|----------------|
| Giardia/E. Histolytica        | 27              | 6.7            |
| Giardia/Cryptosporidium      | 5               | 1.2            |
| Giardia/Salmonella           | 9               | 2.2            |
| Giardia/Shigella             | 6               | 1.5            |
| Giardia/E.coli               | 22              | 5.5            |
| Giardia/Proteus              | 4               | 1.0            |
| Giardia/Enterobacter         | 4               | 1.0            |
| Giardia/Klebsella            | 4               | 1.0            |
| E. histolytica/Cryptosporidium | 2          | 0.5            |
| E. histolytica/Salmonella    | 7               | 1.7            |
| E. histolytica/Shigella       | 2               | 0.5            |

Continued on next page
| Coinfections                     | Number infected | Prevalence (%) |
|----------------------------------|-----------------|----------------|
| E. histolytica/E. coli           | 26              | 6.5            |
| E. histolytica/Proteus           | 5               | 1.2            |
| E. histolytica/Enterobacter      | 2               | 0.5            |
| E. histolytica/Klebsella         | 5               | 1.2            |
| Cryptosporidium/Salmonella       | 3               | 0.7            |
| Cryptosporidium/Shigella         | 1               | 0.2            |
| Cryptosporidium/E. coli          | 2               | 0.5            |
| Cryptosporidium/Klebsella        | 1               | 0.2            |
| Salmonella/Shigella              | 4               | 1.0            |
| Salmonella/E. coli               | 18              | 4.5            |
| Salmonella/Proteus               | 11              | 2.7            |
| Salmonella/Enterobacter          | 1               | 0.2            |
| Salmonella/Klebsella             | 4               | 1.0            |
| Shigella/E. coli                 | 2               | 0.5            |
| Shigella/Proteus                 | 1               | 0.2            |
| Shigella/Enterobacter            | 1               | 0.2            |
| Shigella/Klebsella               | 3               | 0.7            |
| E. coli/Proteus                  | 8               | 2.0            |
| E. coli/Enterobacter             | 4               | 1.0            |
| E. coli/Klebsella                | 5               | 1.2            |
| Proteus/Enterobacter             | 2               | 0.5            |
| Proteus/Klebsella                | 2               | 0.5            |
| Enterobacter/Klebsella           | 1               | 0.2            |
| E. histolytica/E. coli/Proteus   | 3               | 0.7            |
| Giardia/E. histolytica/E. coli   | 3               | 0.7            |
| Giardia/E. histolytica/Salmonella| 6               | 1.5            |
| E. histolytica/E. coli/Salmonella| 5               | 1.2            |
| Giardia/Salmonella/Shigella      | 17              | 4.2            |
| E. histolytica/Salmonella/Proteus| 2               | 0.5            |
| Giardia/Salmonella/E. coli       | 2               | 0.5            |
| Giardia/E. histolytica/Klebsella | 2               | 0.5            |
| Giardia/E. coli/Proteus          | 4               | 1.0            |
| Giardia/E. histolytica/Shigella  | 2               | 0.5            |
| Giardia/E. histolytica/Proteus   | 1               | 0.2            |
Figure S1. Intensity of isolated waterborne disease aetiological agents from Enugu Urban, Nigeria.
Table S2. Risk assessment and association of respondent’s water choices, knowledge and practices to the different waterborne pathogens (Giardia spp., E. histolytica and Cryptosporidium spp.,) in the study population (Number examined = 403).

| Characteristics | Giardia spp. | E. histolytica | Cryptosporidium spp. |
|-----------------|--------------|----------------|---------------------|
| Water choices   | NI (%)       | OR 95% CI      | NI (%)             | OR 95% CI          | NI (%) | OR 95% CI |
| Municipal       | 33(32.7)     | 0.859 0.533,1.385 | 39(36.5) | 1.241 0.774,1.988 | 6(5.9) | 1.208 0.458,3.203 |
| Private well    | 3(18.8)      | 0.412 0.115,1.470 | 2(12.5) | 0.279 0.063,1.247 | 1(6.2) | 1.223 0.157,9.730 |
| Public well     | 63(40.6)     | 1.465 0.965,2.223 | 48(31) | 0.860 0.560,1.320 | 10(8.5) | 1.486 0.616,3.586 |
| Borehole /vendors | 78(36.1) | 1.086 0.721,1.637 | 81(37.5) | 1.558 1.021,2.376* | 6(2.8) | 0.328 0.124,0.862* |
| Stream/rivers   | 6(18.8)      | 0.399 0.160,0.993* | 7(21.9) | 0.544 0.229,1.293 | 2(6.2) | 1.235 0.274,5.557 |
| Rainwater       | 27(36.5)     | 1.069 0.633,1.807 | 23(31.1) | 0.898 0.522,1.545 | 5(6.8) | 1.418 0.500,4.000 |
| Sachet water    | 29(33.3)     | 0.898 0.544,1.483 | 27(31) | 0.892 0.535,1.486 | 3(3.4) | 0.591 0.170,2.056 |
| Reason for the choice |         |                |                    |                    |        |
| Price           | 24(32.4)     | 0.858 0.502,1.467 | 17(23) | 0.548 0.304,0.988* | 9(12.2) | 3.658 1.480,9.037* |
| Distance        | 2(40)        | 1.229 0.203,7.440 | 3(60) | 3.092 0.510,18.734 | 0(0) | 0.947 0.929,9.696 |
| Quality and reliable | 18(28.6) | 0.697 0.386,1.256 | 16(25.4) | 0.649 0.353,1.194 | 1(1.6) | 0.258 0.34,1.958 |
| Available       | 133(36.4)    | 1.847 0.849,4.020 | 122(33.4) | 1.232 0.591,2.507 | 19(5.2) | 0.988 0.221,4.416 |
| Average perception of water safety | 34(31.5) | 0.796 0.497,1.273 | 30(27.8) | 0.717 0.442,1.164 | 3(2.8) | 0.44 0.127,1.524 |
| Knowledge       | NI (%)       | OR 95% CI      | NI (%)             | OR 95% CI          | NI (%) | OR 95% CI |
| Knowledge of waterborne diseases |         |                |                    |                    |        |
| Diarrhoea       | 136(35.8)    | 1.579 0.608,4.100 | 127(33.4) | 1.422 0.547,1.695 | 19(5.0) | 0.553 0.553,1.121 |
| Dysentery       | 45(40.9)     | 1.399 0.891,2.197 | 40(36.4) | 1.229 0.776,1.229 | 6(5.5) | 1.069 0.404,2.830 |
| Cholera         | 46(39.6)     | 1.288 0.807,1.961 | 38(32.2) | 0.950 0.601,1.502 | 3(2.5) | 0.387 0.112,1.339 |
| Typhoid         | 80(39.8)     | 1.483 0.992,2.522 | 61(30.3) | 0.787 0.519,1.193 | 8(4) | 0.603 0.244,1.487 |
| Others          | 13(27.7)     | 0.673 0.343,1.321 | 14(29.8) | 0.845 0.435,1.639 | 1(2.1) | 0.365 0.048,2.786 |
| Don’t know      | 5(33.3)      | 0.916 0.307,2.734 | 4(26.7) | 0.730 0.228,2.338 | 3(20) | 5.139 1.331,19.837* |

Continued on next page
| Characteristics                  | Giardia spp.                | E. histolytica              | Cryptosporidium spp.          |
|---------------------------------|----------------------------|-----------------------------|-------------------------------|
| Knowledge                       | NI (%) OR 95% CI           | NI (%) OR 95% CI           | NI (%) OR 95% CI             |
| Knowledge of factors causing the disease |                             |                             |                               |
| Dirty environments              | 87(32.3) 0.687 0.447,1.054 | 88(32.7) 0.962 0.962,1.493 | 13(4.8) 0.800 0.323,1.979   |
| Unhygienic practices            | 76(34.4) 0.921 0.611,1.389 | 69(31.2) 0.837 0.552,1.269 | 13(5.9) 1.359 0.551,3.355   |
| Drinking contaminated water     | 137(35.3) 1.092 0.366,3.258 | 129(33.2) 1.370 0.428,3.485 | 18(4.6) 0.195 0.050,0.751*  |
| No idea                         | 5(33.3) 0.916 0.307,2.734  | 4(26.7) 0.730 0.228,2.338  | 3(20.0) 5.139 1.331,19.837  |
| Knowledge of water treatment    |                             |                             |                               |
| Have Knowledge of water treatment methods | 42(28.6) 0.624 0.403,0.966* | 36(24.5) 0.532 0.338,0.836* | 12(8.2) 2.445 1.002,5.937*  |
| Practices                       | NI (%) OR 95% CI           | NI (%) OR 95% CI           | NI (%) OR 95% CI             |
| Water storage practices         |                             |                             |                               |
| Plastic bucket with lid         | 51(38.1) 1.202 0.781,1.849 | 54(40.3) 1.623 1.052,2.505* | 5(3.7) 0.613 0.220,1.710    |
| Plastic bucket without lid      | 34(43.6) 1.553 0.938,2.569 | 26(33.3) 1.019 0.603,1.721  | 8(10.3) 2.743 1.095,6.869   |
| Tanks                           | 45(37.5) 1.151 0.738,1.793 | 35(29.2) 0.777 0.489,1.236  | 6(5) 0.940 0.356,2.485      |
| Pots                            | 7(50) 1.881 0.647,5.476   | 6(42.9) 1.547 0.526,4.554  | 0(0) 0.946 0.924,0.969      |
| Gallons                         | 3(7.9) 0.139 0.042,0.462* | 8(21.1) 0.512 0.228,1.150  | 1(2.6) 0.466 0.061,3.574    |
| None(sachet water users)        | 2(10.5) 0.205 0.047,0.901* | 4(21.1) 0.527 0.171,1.621  | 1(5.3) 1.011 0.128,7.960    |
| Water treatment practices       |                             |                             |                               |
| Boiling                         | 35(31.2) 0.782 0.491,1.245 | 31(27.7) 0.709 0.439,1.145 | 9(8.0) 2.032 0.832,4.964    |
| Sedimentation                   | 9(29.0) 0.735 0.329,1.643 | 7(22.6) 0.569 0.239,1.358  | 3(9.7) 2.107 7.589,0.585     |
| Filtration                      | 11(34.4) 0.960 0.449,2.052 | 5(15.6) 0.352 0.132,0.935* | 2(6.2) 1.235 0.274,5.557    |
| Chlorination                    | 5(83.3) 9.489 1.092,8.033* | 4(66.7) 4.155 0.751,22.980 | 0(0) 0.947 0.925,0.969      |
| Other methods                   | 5(83.1) 9.489 1.092,8.033* | 4(66.7) 4.155 0.751,22.980 | 0(0) 0.947 0.925,0.969      |
| Sanitation level                |                             |                             |                               |
| Very good                       | 9(17.3) 0.343 0.162,0.726* | 12(23.1) 0.570 0.288,1.127 | 2(3.8) 0.699 0.188,3.092     |
| Good                            | 56(33.1) 0.853 0.562,1.293 | 56(33.1) 1.010 0.663,1.539 | 9(5.3) 1.041 0.428,2.529     |
| Poor                            | 77(45.0) 2.105 1.389,3.190* | 63(36.8) 1.350 0.888,2.052 | 10(5.8) 1.248 0.518,3.009    |
| Very poor                       | 0(0) 0.638 0.687,0.592   | 2(18.2) 0.443 0.094,2.079  | 0(0) 0.946 0.924,0.969      |

Note: NI = Number infected, OR = Odd ratio, CI = Confidence interval, * Significant at p < 0.05.
Table S3. Risk assessment and association of respondent’s water choices, knowledge and practices to the different waterborne pathogens (*Shigella* spp., *E. coli* and *Proteus* spp.) in the study population (Number examined = 403).

| Characteristics                        | *Shigella* spp. |  |  | *E. coli* |  |  | *Proteus* spp. |  |  |
|----------------------------------------|-----------------|--|--|--|-----------------|--|--|-----------------|--|--|
| Water choices                          | NI (%)| OR | 95% CI | NI (%)| OR | 95% CI | NI (%)| OR | 95% CI |
| Drinking water choices                 |       |   |        |       |   |        |       |   |        |
| Municipal                              | 4(25) | 3.352 | 1.026,10.950* | 7(43.8) | 1.284 | 0.468,3.521 | 0(0) | 0.863 | 0.829,0.896 |
| Public well                            | 11(7.1) | 0.600 | 0.290,1.243 | 7(45.8) | 1.711 | 1.33,2.584* | 24(15.5) | 1.384 | 0.773,2.477 |
| Private well                           | 4(25) | 3.352 | 1.026,10.950 | 7(43.8) | 1.284 | 1.13,0.468 | 0(0) | 0.863 | 0.829,0.898 |
| Borehole/vendors                       | 24(11.1) | 1.433 | 0.728,2.821 | 85(39.4) | 1.135 | 0.758,1.701 | 27(12.5) | 0.885 | 0.496,1.577 |
| Stream/rivers                          | 3(9.4) | 0.963 | 0.279,3.318 | 11(34.4) | 0.845 | 0.395,1.804 | 3(9.4) | 0.664 | 0.195,2.262 |
| Rainwater                              | 1(1.4) | 0.105 | 0.104,0.777* | 35(47.3) | 1.605 | 0.965,2.670 | 10(13.5) | 1.039 | 0.496,2.177 |
| Sachet water                           | 12(13.8) | 1.713 | 0.829,3.539 | 22(25.3) | 0.478 | 0.281,0.841* | 14(16.1) | 1.362 | 0.702,2.643 |
| Reason for the choice                  |       |   |        |       |   |        |       |   |        |
| Price                                  | 3(4.1) | 0.344 | 0.103,1.149 | 31(41.9) | 1.223 | 0.180,6.601 | 4(5.4) | 0.327 | 0.114,0.935* |
| Distance                               | 1(20) | 2.368 | 0.258,21.734 | 2(40.0) | 1.091 | 0.305,1.007 | 0(0) | 0.867 | 0.834,0.901 |
| Quality and reliable                   | 11(17.5) | 2.357 | 1.106,5.024* | 17(27) | 0.554 | 0.667,2.790 | 10(15.9) | 1.303 | 0.617,2.752 |
| Available                              | 33(9.0) | 0.530 | 0.207,1.360 | 141(38.6) | 1.364 | 0.568,1.418 | 48(13.2) | 0.999 | 0.372,2.685 |
| Average perception of water safety     | 18(16.7) | 2.610 | 1.331,5.115* | 39(36.1) | 0.897 | 0.456,1.067 | 15(13.9) | 1.091 | 0.573,2.075 |
| Knowledge                              |       |   |        |       |   |        |       |   |        |
| Knowledge of waterborne diseases       |       |   |        |       |   |        |       |   |        |
| Diarrhoea                              | 37(9.7) | 1.133 | 0.255,5.023 | 139(36.6) | 0.371 | 0.156,0.879* | 50(13.2) | 1.010 | 0.290,3.524 |
| Dysentery                              | 9(8.2) | 0.781 | 0.358,1.703 | 42(38.2) | 1.013 | 0.645,1.590 | 9(8.2) | 0.504 | 0.237,1.071 |
| Cholera                                | 12(10.2) | 1.082 | 0.528,2.215 | 46(39) | 1.063 | 0.684,1.652 | 14(11.9) | 0.849 | 0.442,1.630 |
| Typhoid                                | 20(10) | 1.064 | 2.060,0.550 | 75(37.3) | 0.946 | 0.633,1.415 | 24(11.9) | 0.809 | 0.453,1.445 |
| Others                                 | 7(14.9) | 1.772 | 0.734,4.277 | 22(46.8) | 1.511 | 0.820,2.788 | 6(12.8) | 0.962 | 0.387,2.390 |
| Don’t know                             | 1(6.7) | 0.658 | 0.084,5.142 | 7(46.7) | 1.450 | 0.515,4.083 | 1(6.7) | 0.462 | 0.590,3.584 |

Continued on next page
### Characteristics

| Knowledge                                                                 | Shigella spp.                          | E. coli                  | Proteus spp.                              |
|--------------------------------------------------------------------------|----------------------------------------|--------------------------|-------------------------------------------|
|                                                                          | NI (%) | OR     | 95% CI        | NI (%) | OR     | 95% CI        | NI (%) | OR     | 95% CI        |
| Knowledge of factors causing the disease                                  |         |        |                |         |        |                |         |        |                |
| Dirty environments                                                       | 31(11.5) | 2.051  | 0.919,4.596   | 97(36.1) | 0.786  | 0.514,1.200   | 40(14.9) | 1.626  | 0.837,3.156   |
| Unhygienic practices                                                     | 28(12.7) | 2.255  | 1.090,4.667*  | 81(36.7) | 0.884  | 0.590,1.324   | 32(14.5) | 1.298  | 0.720,2.340   |
| Drinking contaminated water                                              | 38(9.8)  | 1.520  | 0.194,11.881  | 146(37.6) | 0.689  | 0.245,1.941   | 52(13.4) | 2.167  | 0.279,16.825  |
| No idea                                                                 | 1(6.7)   | 0.658  | 0.084,5.142   | 7(46.7)  | 1.450  | 0.515,4.083   | 1(6.7)  | 0.462  | 0.059,3.584   |
| Knowledge of water treatment methods                                     |         |        |                |         |        |                |         |        |                |
| Have Knowledge of water treatment methods                                | 10(6.8)  | 0.571  | 0.270,1.209   | 48(32.7) | 0.697  | 0.456,1.067   | 17(11.6) | 0.799  | 0.432,1.480   |
| Practices                                                                |         |        |                |         |        |                |         |        |                |
| Water storage practices                                                  |         |        |                |         |        |                |         |        |                |
| Plastic bucket with lid                                                  | 7(5.2)   | 0.408  | 0.175,0.915*  | 51(38.1) | 1.006  | 0.656,1.542   | 15(11.2) | 0.766  | 0.405,1.449   |
| Plastic bucket without lid                                               | 8(10.3)  | 1.084  | 0.497,2.462   | 30(38.5) | 1.026  | 0.617,1.706   | 13(16.7) | 1.425  | 0.721,2.816   |
| Tanks                                                                    | 17(14.2) | 1.958  | 0.999,3.837*  | 48(40)   | 1.130  | 0.730,1.751   | 12(10)   | 0.656  | 0.332,1.297   |
| Pots                                                                     | 0(0)     | 0.900  | 0.870,0.930   | 6(42.9)  | 1.235  | 0.420,3.629   | 2(14.3)  | 1.105  | 0.240,5.079   |
| Gallons                                                                  | 4(10.5)  | 1.093  | 0.392,3.309   | 16(42.1) | 1.210  | 0.614,2.384   | 9(23.7)  | 2.264  | 1.006,5.097*  |
| None (sachet water users)                                                | 3(15.8)  | 1.813  | 0.509,6.519   | 2(10.5)  | 0.182  | 0.041,0.797*  | 2(10.5)  | 0.768  | 0.172,3.424   |
| Water treatment practices                                                |         |        |                |         |        |                |         |        |                |
| Boiling                                                                  | 6(5.4)   | 0.443  | 0.180,1.087   | 39(34.8) | 0.829  | 0.527,1.307   | 14(12.5) | 0.923  | 0.480,1.775   |
| Sedimentation                                                            | 3(9.7)   | 1.00   | 0.290,3.453   | 8(25.8)  | 0.545  | 0.237,1.250   | 2(6.5)   | 0.434  | 0.101,1.875   |
| Filtration                                                               | 1(3.1)   | 0.283  | 0.380,2.130   | 13(40.6) | 1.129  | 0.54,2.357    | 2(6.2)   | 0.418  | 0.097,1.804   |
| Chlorination                                                             | 0(0)     | 0.902  | 0.873,0.932   | 3(50)    | 1.647  | 0.328,8.264   | 0(0)     | 0.866  | 0.834,0.901   |
| Other methods                                                            | 0(0)     | 0.902  | 0.873,0.932   | 3(50)    | 1.647  | 0.328,8.264   | 0(0)     | 0.866  | 0.834,0.901   |
| Hygiene level                                                            |         |        |                |         |        |                |         |        |                |
| Very good                                                                | 6(11.5)  | 1.257  | 0.499,3.164   | 11(21.2) | 0.395  | 0.196,0.794*  | 3(5.8)   | 0.369  | 0.111,1.228   |
| Good                                                                     | 14(8.3)  | 0.755  | 0.380,1.500   | 61(36.1) | 0.872  | 0.579,1.312   | 17(10.1) | 0.615  | 0.333,1.137   |
| Poor                                                                     | 18(10.5) | 1.182  | 0.609,2.294   | 76(44.4) | 1.610  | 1.072,2.419*  | 31(18.1) | 2.114  | 1.175,3.801*  |
| Very poor                                                                | 1(9.1)   | 0.932  | 0.116,7.477   | 5(45.5)  | 1.374  | 0.472,4.581   | 2(18.2)  | 1.486  | 0.312,1.137   |

Note: NI = Number infected, OR = Odd ratio, CI = Confidence interval, * Significant at p < 0.05
Table S4. Risk assessment and association of respondent’s water choices, knowledge and practices to the different waterborne pathogens (*Klebsiella* spp., *Enterobacter* spp. and *Salmonella* spp.) in the study population.

| Characteristics                          | *Klebsiella* spp. | *Enterobacter* spp. | *Salmonella* spp. |
|------------------------------------------|-------------------|---------------------|-------------------|
|                                          | OR                | 95% CI              | OR                | 95% CI              | OR                | 95% CI              |
| **Water choices**                        |                   |                     |                   |                     |                   |                     |
| **Drinking water choices**               |                   |                     |                   |                     |                   |                     |
| Municipal                                | 0.823             | 0.105–6.453         | 2.621             | 0.223–1.526         | 0.929             | 0.560–1.752         |
| Private well                             | 1.244             | 0.587–2.638         | 2.261             | 0.557–1.232         | 1.073             | 0.258–3.341         |
| Public well                              | 0.823             | 0.105–6.453         | 2.621             | 0.557–1.232         | 1.143             | 0.656–1.754         |
| Borehole /vendors                        | 1.143             | 0.540–2.421         | 0.929             | 0.574–1.575         | 0.929             | 0.560–1.752         |
| Stream/rivers                            | 1.143             | 0.618–5.815         | 0.929             | 0.560–1.752         | 0.929             | 0.560–1.752         |
| Rainwater                                | 1.691             | 0.722–3.964         | 0.987             | 0.324–3.008         | 1.384             | 0.496–2.746         |
| Sachet water                             | 0.382             | 0.113–1.291         | 1.072             | 0.384–2.994         | 0.726             | 0.386–1.386         |
| **Reason for the choice**                |                   |                     |                   |                     |                   |                     |
| Price                                    | 1.121             | 0.441–2.849         | 1.330             | 0.474–3.728         | 1.384             | 0.761–2.519         |
| Distance                                 | 0.925             | 0.899–0.951         | 0.945             | 0.923–0.967         | 0.799             | 0.761–1.039         |
| Quality and reliable                     | 0.365             | 0.085–1.574         | 1.638             | 0.582–4.614         | 1.322             | 0.679–2.507         |
| Available                                | 1.496             | 0.342–6.538         | 1.043             | 0.234–4.646         | 0.664             | 0.508–1.432         |
| Average perception of water safety       | 0.664             | 0.264–1.672         | 1.026             | 0.391–2.693         | 1.314             | 0.770–2.243         |
| Knowledge                                | 0.664             | 0.264–1.672         | 1.026             | 0.391–2.693         | 1.314             | 0.770–2.243         |
| **Knowledge of waterborne diseases**     |                   |                     |                   |                     |                   |                     |
| Diarrhoea                                | 0.510             | 0.142–1.825         | 1.061             | 1.035–1.088         | 1.188             | 0.392–3.593         |
| Dysentery                                | 0.647             | 0.257–1.627         | 0.773             | 0.298–2.149         | 0.863             | 0.492–1.513         |
| Cholera                                  | 0.583             | 0.232–1.464         | 1.408             | 0.574–3.450         | 0.705             | 0.400–1.242         |
| Typhoid                                  | 0.649             | 0.304–1.385         | 1.483             | 0.619–3.551         | 0.783             | 0.479–1.281         |
| Others                                   | 0.831             | 0.242–2.853         | 1.747             | 0.565–5.402         | 0.678             | 0.292–1.577         |
| Don’t know                               | 1.976             | 0.425–9.204         | 0.943             | 0.921–9.67         | 0.611             | 0.135–2.766         |

Continued on next page
### Characteristics

#### Knowledge of factors causing the disease

| Characteristics | Klebsiella spp. | Enterobacter spp. | Salmonella spp. |
|-----------------|-----------------|-------------------|-----------------|
| NI (%)          | 21(7.8)         | 15(5.6)           | 53(19.7)        |
| OR              | 1.176           | 1.071             | 0.972           |
| 95% CI          | 0.523,2.644     | 0.426,2.694       | 0.579,1.633     |

#### Knowledge of water treatment methods

| Practices | NI (%)          | OR              | 95% CI          |
|-----------|-----------------|-----------------|-----------------|
| Have knowledge | 11(7.5)         | 1.009           | 0.466,2.183     |
| Water storage practices | 7(4.8) | 0.803 | 0.320,2.018 |
| Plastics bucket with lid | 6(4.5) | 0.741 | 0.283,1.940 |
| Plastic bucket without lid | 5(6.4) | 1.241 | 0.443,3.473 |
| Tanks | 6(5.0) | 0.878 | 0.335,2.302 |
| Pots | 0(0) | 0.923 | 0.897,0.950 |
| Gallons | 1(7.1) | 1.348 | 0.168,10.800 |
| None (sachet water users) | 3(7.9) | 1.561 | 0.440,5.358 |
| Water treatment practices | 3(15.8) | 1.144 | 0.669,1.959 |
| Boiling | 8(7.1) | 0.941 | 0.406,2.179 |
| Sedimentation | 3(9.7) | 1.369 | 0.391,4.795 |
| Filtration | 1(3.1) | 0.380 | 0.082,2.888 |
| Chlorination | 0(0) | 0.924 | 0.899,0.951 |
| Other methods | 0(0) | 0.924 | 0.899,0.951 |
| Hygiene level | 1.9 | 0.218 | 0.029,1.633 |
| Good | 11(6.5) | 0.788 | 0.365,1.702 |
| Poor | 15(8.8) | 1.391 | 0.661,2.929 |
| Very poor | 3(27.3) | 5.069 | 1.271,20.217* |

Note: NI = Number infected, OR = Odd ratio, CI = Confidence interval, * Significant at p < 0.05.
