Factors contributing to antibiotic misuse among parents of school‑going children in Dhaka City, Bangladesh

Introduction:

| **Characteristic** | **N = 705***1* |
| --- | --- |
| Parent’s age (years) |  |
| < 25 | 13 (1.8%) |
| > 45 | 47 (6.7%) |
| 25–35 | 377 (54%) |
| 36–45 | 267 (38%) |
| Unknown | 1 |
| Parent’s sex |  |
| Female | 551 (78%) |
| Male | 153 (22%) |
| Unknown | 1 |
| Parent’s education level |  |
| Postgraduate | 175 (25%) |
| Primary | 35 (5.0%) |
| Secondary | 381 (54%) |
| Undergraduate | 113 (16%) |
| Unknown | 1 |
| Employment status |  |
| Employed | 95 (13%) |
| Not employed | 503 (71%) |
| Self employed | 106 (15%) |
| Unknown | 1 |
| Family type |  |
| Extended family | 147 (21%) |
| Nuclear family | 372 (53%) |
| Single parent family | 185 (26%) |
| Unknown | 1 |
| Your average household income per month (BDT) |  |
| High (greater than 50000 BDT) | 139 (20%) |
| Low (less than 30000 BDT) | 160 (23%) |
| Middle (less than 50000 BDT) | 405 (58%) |
| Unknown | 1 |
| Child’s sex |  |
| Female | 379 (54%) |
| Male | 325 (46%) |
| Unknown | 1 |
| Child’s age (years) |  |
| < 5 | 37 (5.3%) |
| > 10 | 313 (45%) |
| 5–9 | 353 (50%) |
| Unknown | 2 |
| Number of children |  |
| >= 3 | 104 (15%) |
| 1 | 176 (25%) |
| 2 | 424 (60%) |
| Unknown | 1 |
| Who is the leading child caregiver at home? |  |
| Father | 54 (7.7%) |
| Grandmother | 16 (2.3%) |
| Mother | 629 (89%) |
| Others | 5 (0.7%) |
| Unknown | 1 |
| Are grandparents at home involved in treatment decisions when your child is ill? |  |
| Always | 34 (4.8%) |
| Never | 459 (65%) |
| Often | 54 (7.7%) |
| Sometimes | 157 (22%) |
| Unknown | 1 |
|  | |

Table 1. Demographic characteristics of study participants (N = 705)

| **Characteristic** | **N = 705***1* |
| --- | --- |
| Information provided by pharmaceutical companies leaflet | 78 (11%) |
| Unknown | 1 |
| Information from prescribers | 607 (86%) |
| Unknown | 1 |
| Information from dispensers | 252 (36%) |
| Unknown | 1 |
| Information from nurses | 22 (3.1%) |
| Unknown | 1 |
| Information given by a colleague | 34 (4.8%) |
| Unknown | 1 |
| Information from University courses | 16 (2.3%) |
| Unknown | 1 |
| Internet | 213 (30%) |
| Unknown | 1 |
| Social media | 165 (23%) |
| Unknown | 1 |
| Others...56 | 89 (13%) |
| Unknown | 1 |
|  | |

**Table 2.** Major sources of information about antibiotic parents (N = 705).

| **Characteristic** | **N = 705***1* |
| --- | --- |
| Knowledge\_level |  |
| Good | 92 (13%) |
| Moderate | 419 (59%) |
| Poor | 194 (28%) |
| Attitude\_level |  |
| Good | 490 (70%) |
| Moderate | 187 (27%) |
| Poor | 27 (3.8%) |
| Unknown | 1 |
| Practice\_level |  |
| Good | 577 (82%) |
| misuse | 127 (18%) |
| Unknown | 1 |
| **Table 3**. Level of knowledge, attitudes, and practices towards antibiotic resistance among parents with school going children (N = 704) | |
| | **Characteristic** | **N** | **OR***1* | **95% CI***1* | **p-value** | | --- | --- | --- | --- | --- | | Parent’s age (years) | 704 |  |  | **<0.001** | | < 25 |  | — | — |  | | > 45 |  | 0.23 | 0.07, 0.76 |  | | 25–35 |  | 0.37 | 0.12, 1.07 |  | | 36–45 |  | 0.21 | 0.07, 0.60 |  | | Parent’s sex | 704 |  |  | **<0.001** | | Female |  | — | — |  | | Male |  | 0.49 | 0.34, 0.71 |  | | Parent’s education level | 704 |  |  | **<0.001** | | Postgraduate |  | — | — |  | | Primary |  | 10.8 | 5.12, 23.3 |  | | Secondary |  | 3.62 | 2.47, 5.33 |  | | Undergraduate |  | 1.77 | 1.09, 2.88 |  | | Employment status | 704 |  |  | **<0.001** | | Employed |  | — | — |  | | Not employed |  | 2.75 | 1.75, 4.37 |  | | Self employed |  | 1.04 | 0.59, 1.82 |  | | Family type | 704 |  |  | 0.6 | | Extended family |  | — | — |  | | Nuclear family |  | 1.07 | 0.73, 1.56 |  | | Single parent family |  | 1.25 | 0.81, 1.93 |  | | Your average household income per month (BDT) | 704 |  |  | **<0.001** | | High (greater than 50000 BDT) |  | — | — |  | | Low (less than 30000 BDT) |  | 3.64 | 2.29, 5.81 |  | | Middle (less than 50000 BDT) |  | 1.61 | 1.08, 2.39 |  | | Child’s sex | 704 |  |  | 0.2 | | Female |  | — | — |  | | Male |  | 0.83 | 0.62, 1.11 |  | | Child’s age (years) | 703 |  |  | **0.077** | | < 5 |  | — | — |  | | > 10 |  | 2.19 | 1.10, 4.36 |  | | 5–9 |  | 2.12 | 1.07, 4.19 |  | | Number of children | 704 |  |  | 0.5 | | >= 3 |  | — | — |  | | 1 |  | 1.02 | 0.63, 1.64 |  | | 2 |  | 0.85 | 0.56, 1.30 |  | | *1*OR = Odds Ratio, CI = Confidence Interval | | | | |   **Table 4.** Factors associated with the level of knowledge among parents of school-going children (N = 704). OR odds ratio, CI confidence interval. \*p-value ˂ 0.05 was considered statistically significant. Significant values are in bold. | |

| **Characteristic** | **N** | **OR***1* | **95% CI***1* | **p-value** |
| --- | --- | --- | --- | --- |
| Parent’s age (years) | 704 |  |  | 0.66 |
| < 25 |  | — | — |  |
| > 45 |  | 1.61 | 0.35, 11.5 |  |
| 25–35 |  | 2.11 | 0.54, 13.9 |  |
| 36–45 |  | 2.01 | 0.51, 13.3 |  |
| Parent’s sex | 704 |  |  | 0.33 |
| Female |  | — | — |  |
| Male |  | 0.82 | 0.55, 1.21 |  |
| Parent’s education level | 704 |  |  | **<0.001** |
| Postgraduate |  | — | — |  |
| Primary |  | 4.84 | 2.29, 10.2 |  |
| Secondary |  | 2.81 | 1.82, 4.44 |  |
| Undergraduate |  | 1.41 | 0.78, 2.53 |  |
| Employment status | 704 |  |  | 0.31 |
| Employed |  | — | — |  |
| Not employed |  | 1.12 | 0.70, 1.86 |  |
| Self employed |  | 1.52 | 0.84, 2.77 |  |
| Family type | 704 |  |  | **<0.001** |
| Extended family |  | — | — |  |
| Nuclear family |  | 2.38 | 1.52, 3.83 |  |
| Single parent family |  | 1.74 | 1.04, 2.96 |  |
| Your average household income per month (BDT) | 704 |  |  | **<0.001** |
| High (greater than 50000 BDT) |  | — | — |  |
| Low (less than 30000 BDT) |  | 3.07 | 1.84, 5.27 |  |
| Middle (less than 50000 BDT) |  | 1.86 | 1.17, 3.04 |  |
| Child’s sex | 704 |  |  | 0.78 |
| Female |  | — | — |  |
| Male |  | 1.05 | 0.76, 1.44 |  |
| Child’s age (years) | 703 |  |  | 0.24 |
| < 5 |  | — | — |  |
| > 10 |  | 1.04 | 0.50, 2.32 |  |
| 5–9 |  | 1.36 | 0.66, 3.02 |  |
| Number of children | 704 |  |  | 0.25 |
| >= 3 |  | — | — |  |
| 1 |  | 1.41 | 0.84, 2.40 |  |
| 2 |  | 1.05 | 0.66, 1.70 |  |
| *1*OR = Odds Ratio, CI = Confidence Interval | | | | |

**Table 5.** Factors associated with the level of attitudes towards antibiotic resistance among parents of school going children (N = 704). OR odds ratio, CI confidence interval. \*p-value ˂ 0.05 was considered statistically significant. Significant values are in bold.

| **Characteristic** | **N** | **OR***1* | **95% CI***1* | **p-value** |
| --- | --- | --- | --- | --- |
| Parent’s age (years) | 704 |  |  |  |
| < 25 |  | — | — |  |
| > 45 |  | 0.90 | 0.22, 4.57 | 0.9 |
| 25–35 |  | 0.51 | 0.15, 2.33 | 0.3 |
| 36–45 |  | 1.05 | 0.31, 4.79 | >0.9 |
| Parent’s sex | 704 |  |  |  |
| Female |  | — | — |  |
| Male |  | 1.41 | 0.90, 2.17 | 0.13 |
| Parent’s education level | 704 |  |  |  |
| Postgraduate |  | — | — |  |
| Primary |  | 8.31 | 3.45, 20.4 | <0.001 |
| Secondary |  | 3.21 | 1.79, 6.20 | <0.001 |
| Undergraduate |  | 3.01 | 1.47, 6.42 | 0.003 |
| Employment status | 704 |  |  |  |
| Employed |  | — | — |  |
| Not employed |  | 0.68 | 0.40, 1.18 | 0.2 |
| Self employed |  | 1.09 | 0.56, 2.12 | 0.8 |
| Family type | 704 |  |  |  |
| Extended family |  | — | — |  |
| Nuclear family |  | 5.07 | 2.53, 11.6 | <0.001 |
| Single parent family |  | 4.05 | 1.91, 9.68 | <0.001 |
| Your average household income per month (BDT) | 704 |  |  |  |
| High (greater than 50000 BDT) |  | — | — |  |
| Low (less than 30000 BDT) |  | 3.02 | 1.57, 6.14 | 0.001 |
| Middle (less than 50000 BDT) |  | 2.24 | 1.24, 4.35 | 0.011 |
| Child’s sex | 704 |  |  |  |
| Female |  | — | — |  |
| Male |  | 1.14 | 0.77, 1.67 | 0.5 |
| Child’s age (years) | 703 |  |  |  |
| < 5 |  | — | — |  |
| > 10 |  | 0.67 | 0.30, 1.66 | 0.4 |
| 5–9 |  | 0.90 | 0.41, 2.18 | 0.8 |
| Number of children | 704 |  |  |  |
| >= 3 |  | — | — |  |
| 1 |  | 0.65 | 0.36, 1.19 | 0.2 |
| 2 |  | 0.65 | 0.39, 1.10 | 0.10 |
| *1*OR = Odds Ratio, CI = Confidence Interval | | | | |

**Table 6**. Factors associated with the level of practices regarding antibiotic resistance among parents of school going children (N = 704). OR odds ratio, CI confidence interval. \*p value ˂ 0.05 was considered statistically significant. Significant values are in bold.

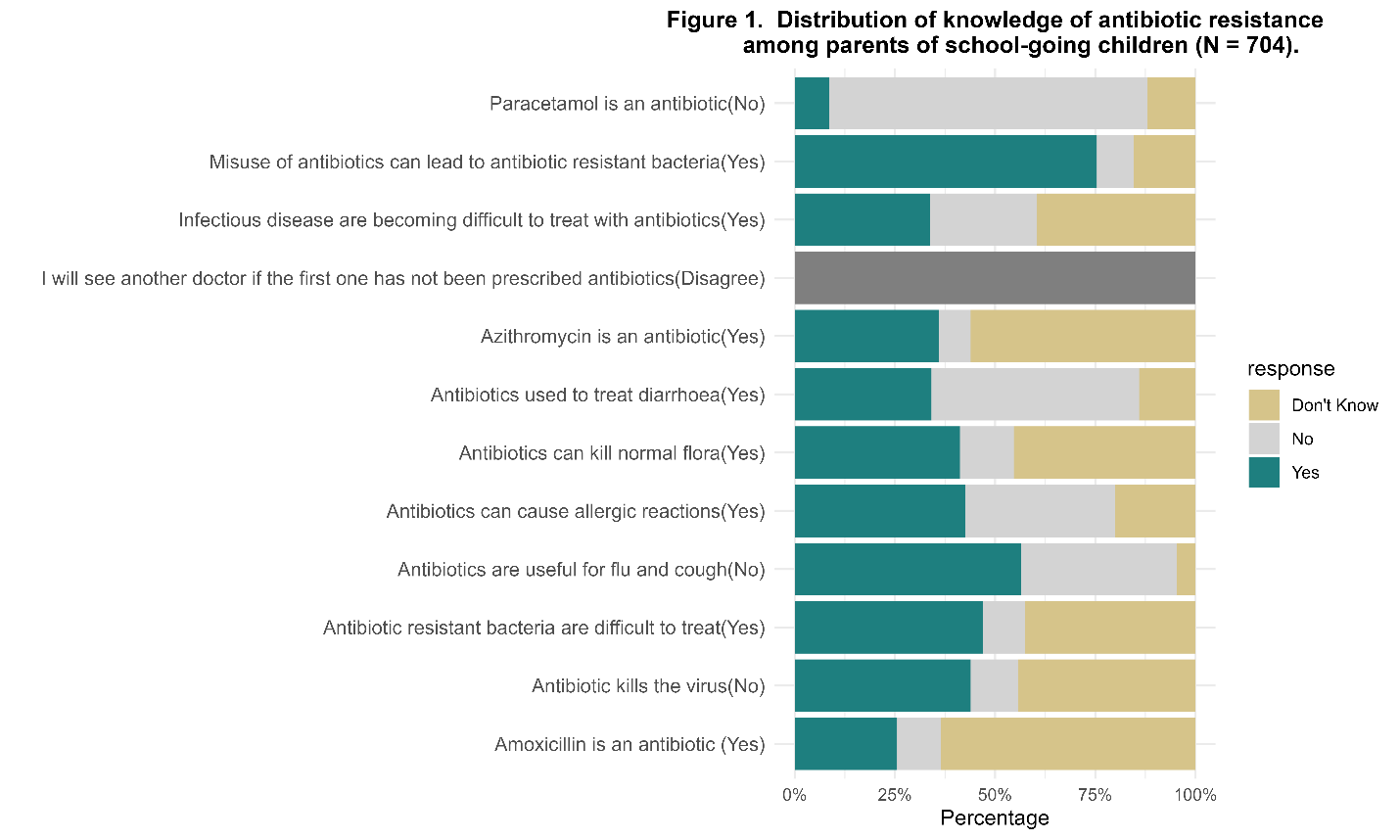


Figure: Figure 1. Distribution of knowledge of antibiotic resistance among parents of school-going children (N = 704)

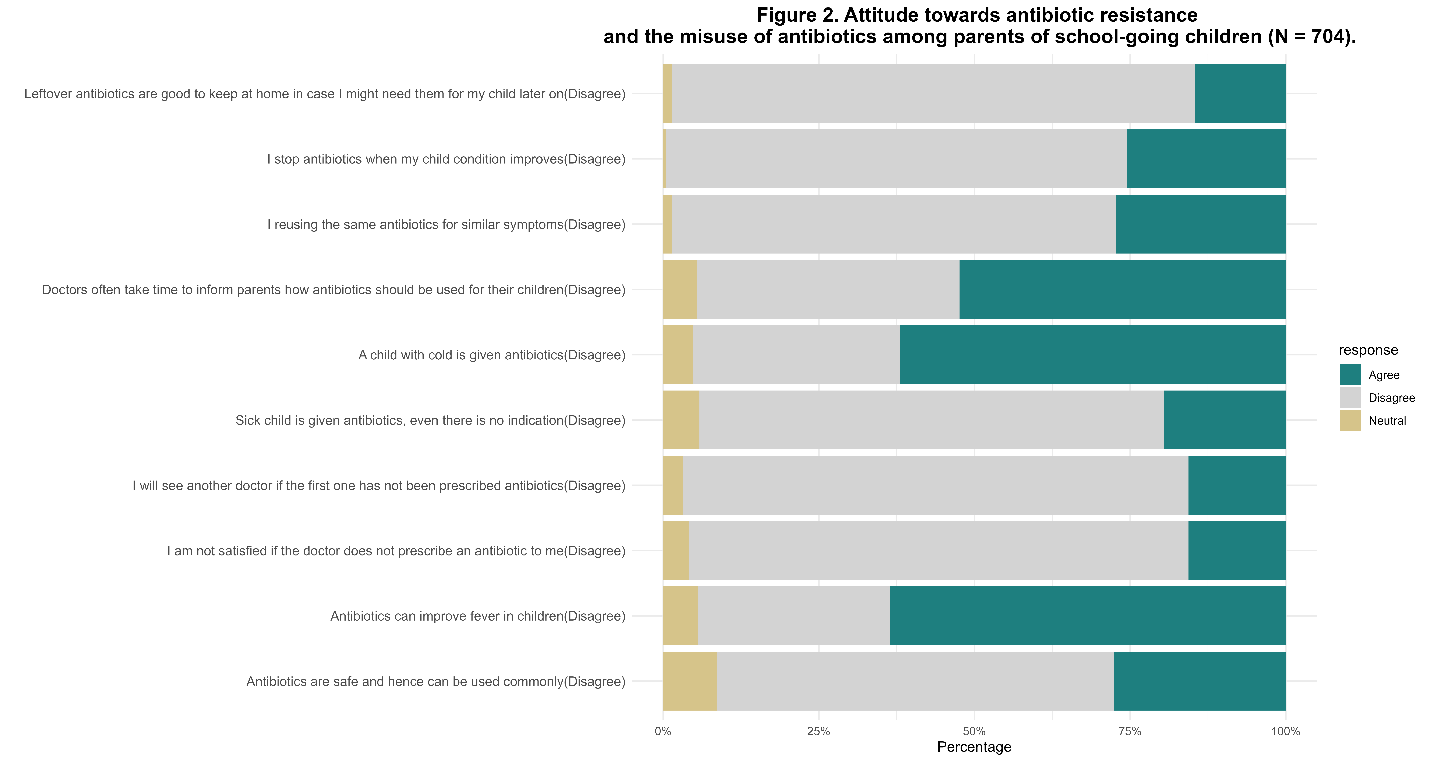


Figure 2. Attitude towards antibiotic resistance and the misuse of antibiotics among parents of school-going children (N = 704).

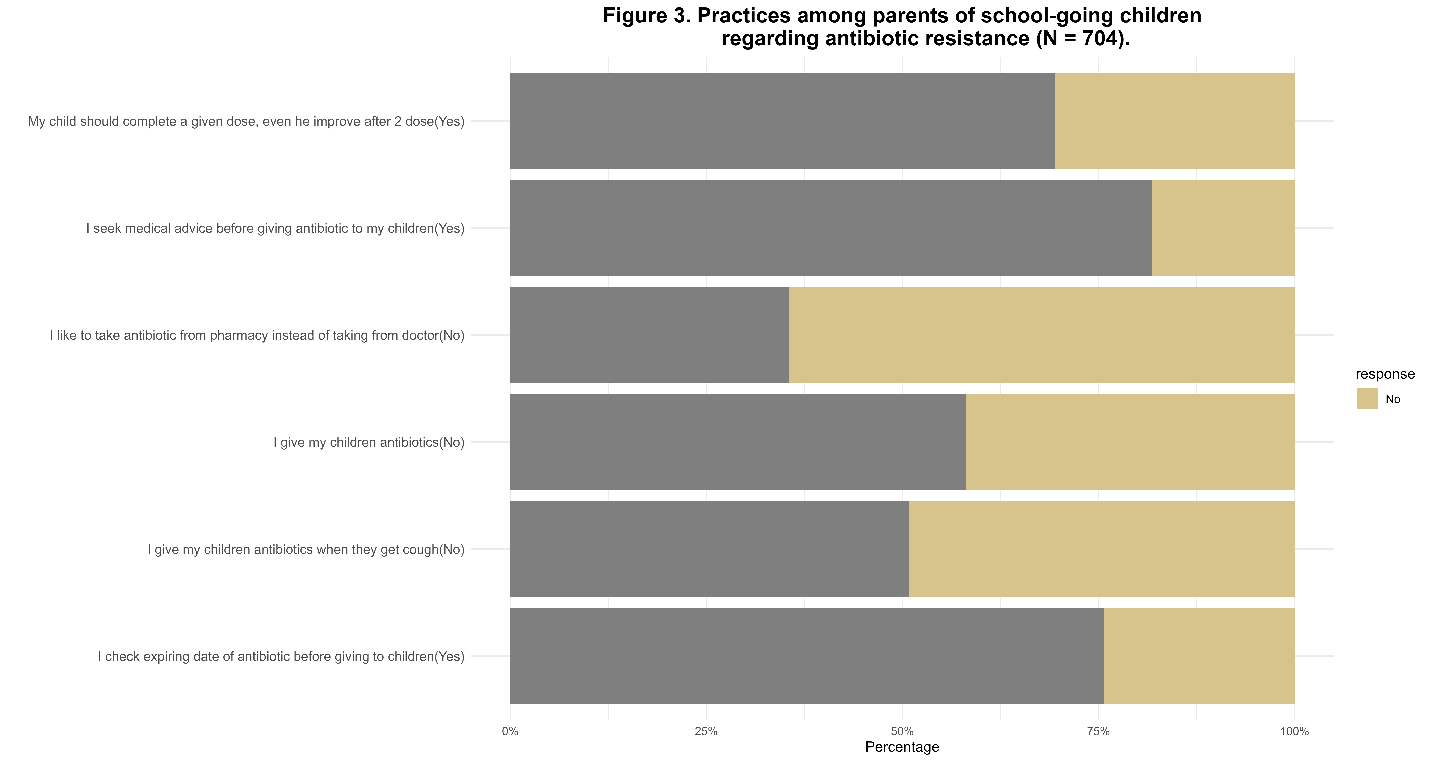


Figure 3. Practices among parents of school-going children regarding antibiotic resistance (N = 704)



Script: #install and load necessary packages

install.packages("usethis")

install.packages("tidyverse")

install.packages("gtsummary")

install.packages("easystats")

install.packages("gt")

install.packages("ggplot2")

install.packages("naniar")

install.packages("ggthemes")

install.packages("RColorBrewer")

install.packages("rio")

install.packages("sjPlot")

install.packages("MASS")

install.packages("flextable")

install.packages("report")

install.packages("broom.helpers")

library(broom.helpers)

library(report)

library(tidyverse)

library(gtsummary)

library(easystats)

library(gt)

library(ggplot2)

library(naniar)

library(ggthemes)

library(RColorBrewer)

library(rio)

library(sjPlot)

library(tidyr)

library(MASS)

library(dplyr)

library(scales)

#Import data

KAP1<-readxl::read\_xlsx("data/AMR\_KAP\_Data.xlsx",sheet = 1)

KAP2<-readxl::read\_xlsx("data/AMR\_KAP\_Data.xlsx",sheet = 3)

#Check missing values

gg\_miss\_var(KAP2)

#Check Duplicated rows

sum(duplicated(data))

#Table 1. Demographic characteristics of study participants

KAP2 |>

select(1:11)|>

tbl\_summary()|>

as\_gt()|>

gtsave("C:/Users/HUAWEI/Downloads/R assignment Amr/tables/demographic\_tbl.docx")

#Table 2. Major sources of information about antibiotic of parents

KAP2 |>

select(48:56)|>

tbl\_summary() |>

as\_gt()|>

gtsave("C:/Users/HUAWEI/Downloads/R assignment Amr/tables/sources\_tbl2.docx")

#Table 3. Level of knowledge, attitudes, and practices

KAP2 <- KAP2|>

mutate(Knowledge\_level = case\_when(

`pct of knowledge` < 25 ~ "Poor",

`pct of knowledge` <= 50 ~ "Moderate",

`pct of knowledge`>= 50 ~ "Good",

))|>

mutate(Attitude\_level = case\_when(

`pct of attitude` < 25 ~ "Poor",

`pct of attitude` <= 50 ~ "Moderate",

`pct of attitude` >= 50 ~ "Good"

)) |>

mutate(Practice\_level = case\_when(

`pct of practices` < 50 ~ "misuse",

`pct of practices` >= 50 ~ "Good"

)) |>

select(70:72)|>

tbl\_summary() |>

as\_gt()|>

gtsave("C:/Users/HUAWEI/Downloads/R assignment Amr/tables/level\_of\_KAP\_tbl.docx")

#Table 4. Factors associated with the level of knowledge

KAP2$`Parent’s sex`<-factor(KAP2$`Parent’s sex`)

KAP2$`Parent’s education level` <-factor(KAP2$`Parent’s education level` )

KAP2$`Employment status`<-factor(KAP2$`Employment status`)

KAP2$`Family type`<-factor(KAP2$`Family type`)

KAP2$`Your average household income per month (BDT)`<-factor(KAP2$`Your average household income per month (BDT)`)

KAP2$`Child’s sex`<-factor(KAP2$`Child’s sex`)

KAP2$`Child’s sex`<-factor(KAP2$`Child’s sex`)

KAP2$`Number of children`<-factor(KAP2$`Number of children`)

#regression\_tbl knowledge level

colnames(KAP2)

data\_knowledge<-KAP2[,c(1:9,70)]

colnames(data\_knowledge)

#convert to factor

data\_knowledge$Knowledge\_level <-factor(data\_knowledge$Knowledge\_level)

tbl\_uvreg<-data\_knowledge|>

tbl\_uvregression(

method = polr,

y=Knowledge\_level,

exponentiate = TRUE

)|>

add\_global\_p()|>

bold\_p(t=0.10)|>

as\_gt()|>

gtsave("C:/Users/HUAWEI/Downloads/R assignment Amr/tables/regression\_tbl1.docx")

#regression\_tbl attitude

colnames(KAP2)

data\_knowledge<-KAP2[,c(1:9,71)]

colnames(data\_knowledge)

data\_knowledge$Attitude\_level <-factor(data\_knowledge$Attitude\_level)

tbl\_uvreg2<-data\_knowledge|>

tbl\_uvregression(

method = polr,

y=Attitude\_level,

exponentiate = TRUE,

pvalue\_fun = label\_style\_pvalue(digits=2),

)|>

add\_global\_p()|>

bold\_p(t=0.10)|>

as\_gt()|>

gtsave("C:/Users/HUAWEI/Downloads/R assignment Amr/tables/regression\_tbl2.docx")

#regression table practice

colnames(KAP2)

data\_knowledge<-KAP2[,c(1:9,72)]

colnames(data\_knowledge)

data\_knowledge$Practice\_level <-factor(data\_knowledge$Practice\_level)

tbl\_uvreg3<-

data\_knowledge|>

tbl\_uvregression(

method = glm,

y=Practice\_level,

method.args =list(family=binomial(link="logit")),

exponentiate = TRUE)|>

as\_gt()|>

gtsave("C:/Users/HUAWEI/Downloads/R assignment Amr/tables/regression\_tbl3.docx")

# Figure 1. Distribution of knowledge of antibiotic resistance

fig\_data1 <- KAP1|>

select(13:24)

#data reshape

long\_fig\_data <- fig\_data1|>

pivot\_longer(cols = 1:12,

names\_to ="question",

values\_to = "response")

summary\_data<-long\_fig\_data|>

group\_by(question,response)|>

summarise(count=n(),.groups = 'drop')|>

mutate(Percentage = count/sum(count)\*100)

#plot

plot1<-ggplot(summary\_data,aes(x=question,y=Percentage,fill = response))+

geom\_bar(stat = "identity",position ="fill")+

coord\_flip()+

scale\_y\_continuous(labels =scales::percent)+

scale\_fill\_manual(values =c("Yes"= "#1E7F7F",

"No"="#D3D3D3",

"Don't Know" ="#D6C48A"))+

labs(title = "Figure 1. Distribution of knowledge of antibiotic resistance

among parents of school-going children (N = 704).",

x="",

y="Percentage",

fill = "response")+theme\_minimal()+

theme(axis.text.y = element\_text(size = 10),

plot.title = element\_text(size = 12,face = "bold",hjust = 0.5))

ggsave("C:/Users/HUAWEI/Downloads/R assignment Amr/figures/figure1.png",

plot = plot1,

width = 10,

height = 6,

dpi = 600)

#Figure 2.Attitude towards antibiotic resistance and the misuse of antibiotics

fig\_data2<-KAP1|>

select(24:33)

#wide to long format

long\_fig\_data2<-fig\_data2|>

pivot\_longer(

cols = 1:10,

names\_to = "question",

values\_to = "response"

)

#Count the responses for each question

summary\_data2<-long\_fig\_data2|>

group\_by(question,response)|>

summarise(count=n(),.groups ='drop')|>

mutate(Percentage=count/sum(count)\*100)

#plot creation

plot2<-ggplot(summary\_data2,aes(x=question,y=Percentage,fill=response))+

geom\_bar(stat = "identity",position = "fill")+

coord\_flip()+

scale\_y\_continuous(labels = scales::percent)+

scale\_fill\_manual(values = c("Agree"="#1E7F7F",

"Disagree" = "#D3D3D3",

"Neutral" = "#D6C48A" ))+

labs(title = " Figure 2. Attitude towards antibiotic resistance

and the misuse of antibiotics among parents of school-going children (N = 704).",

x="",

y="Percentage",

fill="response")+

theme\_minimal()+

theme(axis.text.y = element\_text(size =10),

plot.title = element\_text(size = 15,face = "bold",hjust = 0.5))

ggsave("C:/Users/HUAWEI/Downloads/R assignment Amr/figures/figure2.png",

plot = plot2,

width = 15,

height = 8,

dpi = 600)

## Figure 3. Practices among parents

fig\_data3<-KAP1|>

select(34:39)

#reshaping data

long\_fig\_data3<-fig\_data3|>

pivot\_longer(

cols = 1:6,

names\_to ="question",

values\_to ="response"

)

# Count the responses for each question

summary\_data3<-long\_fig\_data3|>

group\_by(question,response)|>

summarise(count=n(),.groups = 'drop')|>

mutate(Percentage=count/sum(count)\*100)

#plot creation

plot3<-ggplot(summary\_data3,aes(x=question,y=Percentage,fill=response))+

geom\_bar(stat = "identity",position = "fill")+

coord\_flip()+

scale\_y\_continuous(labels = scales::percent)+

scale\_fill\_manual(values = c("yes"="#1E7F7F",

"No" = "#D6C48A"))+

labs(title = "Figure 3. Practices among parents of school-going children

regarding antibiotic resistance (N = 704).",

x="",

y="Percentage",

fill="response")+

theme\_minimal()+

theme(axis.text.y = element\_text(size = 10),

plot.title = element\_text(size = 16,face = "bold",hjust = 0.5))

ggsave("C:/Users/HUAWEI/Downloads/R assignment Amr/figures/figure3.png",

plot = plot3,

width = 15,

height = 8,

dpi = 600)