**ORIGINAL RESEARCH**

# The ABO and Rhesus (Rh) blood groups of the Purana population of Sigiriya, Sri Lanka, and the disease risk

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## Abstract

**Background:** Rhesus and ABO blood group systems exhibit significant differences due to genetics, geography, ethnic diversity. The purpose of this study was to determine the prevalence of the ABO and Rh blood groups among Purana (old) population in Sigiriya, Sri Lanka, and to predict the risk of diseases with reference to their blood group.

**Methods:** Total of 384 adult Purana individuals were randomly chosen for a cross-sectional descriptive study in Purana villages of Talkote, Diyakepilla, Nagalaweva, and Pidurangala. Employing slide method and commercially available antisera, ABO and Rh phenotypes were determined. Using Hardy-Weinberg equilibrium, the frequencies of alleles A, B, O, D, and d were estimated. SPSS software version 23 was used for analysis. The disease risk in this community was predicted according to the prevailing literature.

**Results:** Blood type "O" (46%) was the predominant phenotype. The "AB" blood group exhibited the lowest phenotypic frequency (4%). There were 39% and 11% of "B" and "A" blood types, respectively. 99% of subjects exhibited Rh phenotype, while 1% were Rh negative. AA, AO, BB, BO, and AB genotype distributions were 7.3%, 28%, 0.2%, 6.4%, and 3.5%, respectively. Majority (48%) belonged to the OO genotype. Distribution of DD, Dd, and dd genotypes was 76%, 22%, and 2%, respectively. According to the results, risk of diseases for the majority of Purana population such as coronary artery disease, infectious diseases such as cholera, mumps and cancers could be predicted by previous evidence.

**Conclusion:** This study shows that pattern of phenotype and genotype distribution of Purana population is different from the distribution pattern among modern Sri Lankans. Majority in this population has risk of developing diseases such as coronary artery disease, peptic ulcers, infectious diseases such as cholera, mumps and tuberculosis infection.

**Keywords:** ABO blood group system, rhesus blood group system, phenotypes, genotypes, disease risk, Purana population

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## Introduction

The ABO blood group system consists of four different blood types on the basis of presence or absence of A and B surface antigens (1). These antigens are inherited in a Mendelian fashion from parents to children and appear early in foetal life and remain until death (2). These ABO antigens are controlled by three allelic genes on chromosome 9q. A and B antigens are strongly antigenic in nature, located on the surface of red blood cells while the anti- A and anti-B antibodies are present naturally in the plasma of persons lacking the corresponding antigen (3).

Rh blood group is considered as the second most important blood group. This is a multi-antigen system expressed by three pairs of closely linked genes which are located on chromosome 1 (3). This is identified with presence of D antigen on the red cells. If D antigen is present in individuals blood it is known as Rh positive, while those lacking the antigen are known as Rh negative (4). The blood grouping plays an important role in routinely screening for blood transfusion and transplantation, pregnancy, paternity testing, forensic and legal medicine (5). In addition to that, ABO and Rh blood groups are useful in clinical studies, genetic studies, prediction of disease risk with reference to blood group and researching population migration patterns (6).

The knowledge on the distribution of these two blood group systems is beneficial for compatible blood transfusion and proper management of blood banks. According to previous studies, these frequencies exhibit significant variation due to genetic, geographical locations and ethnic diversity in different parts of the world (7). As well as previous studies reported that the blood groups are having some association with diseases such as duodenal ulcers, peptic ulcers, gastritis, diabetes mellitus, urinary tract infection, hyperlipidemia, hypertension etc (8). Thus, it is important to investigate the frequencies of blood groups in different populations, identify the pattern of inheritance and identify the disease risk with reference to the blood group distribution. This could provide a clue to take necessary preventive measures to reduce the disease risk among different populations and also to reduce the health care cost.

In the Sri Lankan context, there is a paucity of literature on the distribution of blood groups and their disease risk in the multi-cultural society, including different types of ethnic groups, socio-economic groups, Purana (old) population and as well as indigenous people such as “Vedda” population. According to the recent statistics of the National Blood Transfusion Service, Sri Lanka, 41.68% of the blood donors were “O” positive. The percentages of “B” positive, “A” positive and “AB” positive blood donors were 26.43%, 20.63% and 5.32% respectively. A national level study has been done by NS De Zoysa in 1985 among four main ethnic groups (Sinhalese, Tamils, Moor and Burghers) in Sri Lanka revealed that the average distribution of “O”, “A”, “B”, “AB” and Rh is 46%, 22%, 28%, 6%, and 95% respectively (9). All the major ethnic groups have reported with higher percentage of “O” positive blood. But no literature was found regarding blood groups distribution among Purana communities and

their disease risk prediction with reference to blood groups.

The Purana communities in Sri Lanka have been identified as isolated middle-class population groups inhabiting a remote rural environment. This population is considered as genetically and morphometrically isolated from the rest of Sri Lankans (10). Their genealogy has been traced back to the fifth century A.D. and presently these Purana people are genetically admixing with modern people in Sri Lanka in danger of extinct. They are presently residing in some of the rural villages in Sigiriya suburbs such as Thalkote, Pidurangala, Diyakepilla, Alakolawewa, Nagalawewa etc. Purana community living in theses villages could be identified by their surnames such as Undiyagedara, Aluthgedara, Gamagedara, Millagahagedara, Beddegedara, Kongahagedara etc. They highly maintain their caste system by intermarriages done only within their community. Therefore, they are having isolated breeding units (10) and the "A", "B", "O" and Rh blood groups distribution among them may be very specific. Furthermore, they may have a unique disease risk with reference to their blood groups when compared with the other Sri Lankans. Therefore, this study was designed to identify the prevalence of ABO blood group types, Rh frequencies and to predict the disease risk associated with blood groups in this Purana population residing in Sigiriya, Sri Lanka.

## Materials and Methods

This study was carried out as a cross-sectional descriptive study with a randomly selected sample of 384 adult participants living in Purana villages named Talkote, Diyakepilla, Nagalaweva, Pidurangala which are located at the foot of Sigiriya rock. The sample size (384) was calculated using the Cochrane formula for the unknown population (n= (z2 pq)/d2). For the sampling purpose, an updated electoral register was obtained from the Grama Niladhari of each division. The number of samples for each village was calculated proportionately with reference to number of Purana inhabitants in each village. The number of individuals selected for the study from Pidurangala, Talkote, Nagalaweva and Diyakepilla were 120, 90, 110 and 64 respectively. The selection of Purana individuals was based on the Purana pedigree recorded in the survey conducted at the Purana villages in 1981 (11). The selected pedigrees Gamagedara, Aluthgedara, Undiyagedara, Liyanagedara and Beddedara represented the Purana population in Talkote, Pidurangala and Diyakepilla villages and Millagahagedara, Kongahagedara and Aluthgedara pedigrees represented the Purana population in Nagalaweva village also included in the study. This sample was selected according to the verbal Purana pedigree analysis and the pedigree was traced back to at least three generations back. According to the inclusion criteria, the selected individuals were marked in the updated electoral register obtained from each Grama Niladhari division and participants were randomly selected for the study. Then the selected individuals were given the opportunity to inform their consent before being enrolled into the study. The exclusion criteria included those who belonged to other pedigree and individuals with

psychiatric/cognitive disorders or language barriers, individuals who were extremely debilitated or participated in the pre-test and pregnant or lactating mothers.

The ABO and Rh phenotypes of each participant was identified using commercially made antisera; anti- A, anti- B and anti-D antibodies by slide method. Three drops of capillary blood from each individual were taken by an experienced medical officer using lancets under the strict sterile conditions. Then for each blood drop, a drop of anti- A, anti- B and anti-D antibodies were added and mixed. A, B, O blood group and Rh blood group of each sample was identified by observing the agglutination after 5 minutes. Confirmation of agglutination was observed under the light microscope.

The disease risk with reference to blood groups in this community was predicted according to the prevailing literature. Many studies have investigated about the association between different disease conditions with the ABO blood groups. A review article published in 2021 has reported about the association between many diseases; infectious diseases, cancers, circulatory diseases, cognitive disorders, metabolic diseases, hypertension, hyperlipidemia, diabetes mellitus with the ABO blood groups (8). With these findings, the disease risk in Purana population was predicted in order to identify their susceptibility or resistant to various diseases.

Hardy–Weinberg equilibrium was used to determine the frequencies of alleles “A”, “B”, “O”, “D” and “d”. [4] Blood group phenotypic frequencies were reported in percentages and the allele frequencies were calculated by using the assumptions of Hardy-Weinberg equilibrium. The following equation was used for the calculation.

For ABO blood group,
$p + q + r = 1$,
$p2 + q2 + r2 + 2pq + 2pr + 2qr = 1$

For Rhesus factor,
$a + b = 1$,
$a2 + 2ab + b2 = 1$

Statistical analysis was done by using SPSS software version 23 to determine mean percentage distribution of each blood group of Purana population and among Purana individuals residing in four Purana villages separately. The Chi-squared test was used to test the blood group distribution in each village, as well as to compare observed allelic and genotypic frequency distributions of the blood groups in each village. Also, it was used to test the blood group distribution of Purana population and reported modern Sri Lankans such as Sinhalese, Tamils, Moors and Burgers as well as to compare observed allelic and genotypic frequency distributions of the blood groups among them. The level of statistical significance was taken at $P<0.05$.

Ethical clearance for the study was obtained from the Ethic Review Committee (ERC) of Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka. Permission to conduct the study was obtained from relevant Grama Niladhari of each Gramaseva division. An information sheet was provided prior to the invitation to participate to the survey and written consent was obtained from all participants.

## Results

Total numbers of 384 adult participants were included in the study. Statistical analysis was done by using SPSS software version 23. According to the analysis, the blood group "O" (46%) was the dominant phenotype trait found in the Purana population as an average. The lowest phenotype frequency was the "AB" blood group which was 4% from the total sample. Percentage of "B" blood group was 39% and "A" blood group was 11% in this population. Ninety nine percent of Purana individuals showed Rh phenotype while the one percent of population was Rh negative (9) (Table 1).

In Pidurangala village 54% of the participants were discovered with "B" blood group while only 35% was "O" blood group. But other three villages showed a majority of "O" blood group with percentages of 54%, 45% and 58% in Nagalawewa, Talkote and Diyakepilla respectively. When considering the blood group distribution among all four villages collectively, the major blood group was the "O" blood group with a percentage of 46% and B blood group was 39%. Blood group "A" and "AB" showed relatively similar pattern of distribution among four villages and averages percentages were 11% and 4% respectively (Table 1).

The calculated averages of blood groups "A", "B", "O" and Rh of the Purana population were compared with the reported averages of blood groups of major ethnic groups (Sinhalese, Tamils, Moor, Burghers) in Sri Lanka (9). According to the comparison, the average percentage of blood group "O" phenotype was 43% in general Sri Lankan population and 46% in Purana population.

**Table 1: Summary of the distribution of each blood group among Talkote, Diyakepilla, Nagalaweva and Pidurangala**

| Blood group | *Nagala wewa* | *Piduran gala* | *Talkote* | *Diyake pilla* | *Avg. Purana Population* |
|---|---|---|---|---|---|
| **A** | 10% | 7% | 20% | 8% | 11% |
| **B** | 33% | 54% | 33% | 29% | 39% |
| **AB** | 3% | 4% | 2% | 5% | 4% |
| **O** | 54% | 35% | 45% | 58% | 46% |
| **Rh+** | 97% | 99% | 98% | 99% | 99% |
| **Rh-** | 3% | 1% | 2% | 1% | 1% |

It was the dominant phenotype of all ethnic groups in Sri Lanka and also in Purana population. "AB" blood group showed the lowest frequency in both Purana (4%) and other ethnic groups in Sri Lanka (6%). Majority of all four ethnic groups (94%) as well as Purana population (99%) showed Rh positive phenotype. Only 6% in other ethnic groups and 1% in Purana community was Rh negative (Table 2, Table 3).

**Table 2: Percentage distribution of ABO and Rh blood groups in modern Sri Lankans (Reference: de Zoysa NS, 1985)**

| Blood group | Sinhala | Tamil | Muslim | Burgher | *Avg. SL population* |
|---|---|---|---|---|---|
| **A** | 22% | 21% | 23% | 26% | 23% |
| **B** | 27% | 33% | 28% | 26% | 29% |
| **AB** | 06% | 07% | 06% | 04% | 6% |
| **O** | 45% | 39% | 42% | 46% | 43% |
| **Rh+** | 95% | 96% | 96% | 94% | 94% |
| **Rh-** | 07% | 05% | 04% | 06% | 6% |

**Table 3: Comparison of Blood group Phenotypes between modern Sri Lankans and Purana population**

| Phenotype | Avg. SL population | Avg. Purana Population |
|---|---|---|
| **A** | 23% | 11% |
| **B** | 29% | 39% |
| **AB** | 6% | 04% |
| **O** | 43% | 46% |
| **Rh+** | 94% | 99% |
| **Rh-** | 6% | 01% |

Genotypes of "A" blood group are AA and AO. The expected allele frequency according to the Hardy-Weinberg equilibrium, the Purana population showed AA genotype of 7.3% and AO, 28%. "B" blood group carries BB and BO alleles and according to the Hardy-Weinberg equilibrium, Purana population showed 0.2% of BB genotype and 6.4% of BO genotype. When considering "AB" blood group, this population was presented with 3.5% AB genotype. The percentage of OO genotype was 48% (Table 4, Table 5).

**Table 4: Genotypes and expected frequencies of genotype distribution of the ABO and Rh blood groups according to Hardy–Weinberg equilibrium**

| Blood Group (Phenotype) | Genotype | Phenotypic frequency | Expected frequency |
|---|---|---|---|
| **A** | AA + AO | nA | $p^2 + 2pr$ |
| **B** | BB + BO | nB | $q^2 + 2qr$ |
| **AB** | AB | nAB | 2pq |
| **O** | OO | nO | $r^2$ |
| **Rh+** | DD + Dd | nD | $a^2 + 2ab$ |
| **Rh-** | dd | nd | $b^2$ |

Rhesus blood group genotype distribution in this population was also calculated according to the Hardy-Weinberg equilibrium. According to the results, DD, Dd and dd genotypes distributions were 76%, 22% and 2% respectively (Table 5).

Blood group genotype distributions of Purana population were compared with the genotype distribution of major ethnic groups in Sri Lanka. According to the comparison, AA, AO, BB, BO, AB, OO genotype distributions were 4.8%, 28.6%, 2%, 17.7%, 5.7%, 48% respectively among major ethnic groups. Rhesus factor genotype distributions of DD, Dd and dd were 58.8%, 35.7% and 5.5% respectively (Table 6, Table 7).

Previous literature reported that blood group "O" is associated with increased incident of cholera, plague, mumps, peptic ulcers and tuberculosis infection. It has been found that the blood group "O" has more susceptibility to infections like Escherichia Coli and other gastrointestinal infections. As the majority of the Purana population (46%) was presented with blood group "O", they are having a greater risk of developing these disease conditions which are associated with the "O" blood group. As well as blood group "O" has showed diseases resistant to venous thromboembolism, pancreatic cancer, and severe malaria. With reference to literature evidence on blood group types and their disease risk, it could be predicted that majority in Purana community are at a risk of developing diseases such as cholera, plague, mumps, peptic ulcers, and tuberculosis infection (8).

**Table 6: Genotype frequencies of ABO and Rh blood groups in modern Sri Lankans according to Hardy–Weinberg equilibrium**

| Blood group | Genotypes | Sinhalese | Tamils | Muslims | Burghers | Genotype Percentage | |
|---|---|---|---|---|---|---|---|
| **A** | $p^2 + 2pr$ | 22% | 21% | 23% | 26% | $p^2$ | 4.8% |
| | | p2 = 0.048, 2pr = 0.294 | p2 = 0.043, 2pr = 0.258 | p2 = 0.043, 2pr = 0.268 | p2 = 0.057, 2pr = 0.322 | 2pr | 28.6% |
| **B** | $q^2 + 2qr$ | 27% | 33% | 28% | 26% | $q^2$ | 2% |
| | | q2 = 0.012, 2qr = 0.148 | q2 = 0.031, 2qr = 0.218 | q2 = 0.031, 2qr = 0.227 | q2 = 0.007, 2qr = 0.114 | 2qr | 17.7% |
| **AB** | 2pq | 06% | 07% | 06% | 04% | 2pq | 5.7% |
| | | 2pq = 0.06 | 2pq = 0.07 | 2pq = 0.06 | 2pq = 0.04 | | |
| **O** | $r^2$ | 45% | 39% | 42% | 46% | $r^2$ | 43% |
| | | r2 = 0.45 | r2 = 0.39 | r2 = 0.42 | r2 = 0.46 | | |
| **Rh+** | $a^2 + 2ab$ | 95% | 96% | 96% | 94% | $a^2$ | 58.8% |
| | | a2 = 0.541, 2ab = 0.389 | a2 = 0.603, 2ab = 0.347 | a2 = 0.64, 2ab = 0.32 | a2 = 0.570, 2ab = 0.369 | 2ab | 35.7% |
| **Rh-** | $b^2$ | 07% | 05% | 04% | 06% | $b^2$ | 5.5% |
| | | b2 = 0.07 | b2 = 0.05 | b2 = 0.04 | b2 = 0.06 | | |

**Table 7: Comparison of ABO and Rh blood group genotypes between modern Sri Lankan population and Purana population**

| Genotype percentages | Modern Sri Lankan Population | Purana Population |
|---|---|---|
| **$p^2$** | 4.8% | 7.3% |
| **2pr** | 28.6% | 28% |
| **$q^2$** | 2% | 0.2% |
| **2qr** | 17.7% | 6.4% |
| **2pq** | 5.7% | 3.5% |
| **$r^2$** | 43% | 48% |
| **$a^2$** | 58.8% | 76% |
| **2ab** | 35.7% | 22% |
| **$b^2$** | 5.5% | 2% |

In this community, blood group “B” was the second most dominant blood group (39%). When comparing to previous evidence, Purana individuals having blood group “B” may have higher incidence of gonorrhoea, tuberculosis, and Streptococcus pneumonia, E. coli, and salmonella infection and diabetes mellitus. In addition, this blood group has a higher rate of hypertension when compared with other blood groups.

## Discussion

The most common blood phenotype of the Purana population is the “O” (46%). The rest of blood group phenotype frequencies were B>A>AB. The majority of this population was Rhesus positive (99%). Only 1% of the population was Rhesus negative. According to the Hardy-Weinberg equilibrium the “OO” genotype showed the highest frequency (48%) in this population. The second highest percentage of genotype was “AO” (28%). The lowest genotype percentage was 0.2% of “BB” alleles. When considering the Rhesus factors “DD” genotype showed the highest frequency among Purana population and it was 76%. Only 2% of this population presented with “dd” alleles.

The calculated averages of blood groups “A”, “B”, “O” and Rh of the Purana population were compared with the averages of blood groups of major ethnic groups (Sinhalese, Tamils, Moor, Burghers) in Sri Lanka (9). According to the comparison, the percentage of “O” phenotype was 43% and it was the dominant phenotype of all ethnic groups in Sri Lanka and “AB” blood group showed the lowest frequency (6%). Majority of all four ethnic groups showed Rh positive phenotype and the percentage was 94%. Only 6% was Rh negative.

In both present Sri Lanka population and the Purana population, the most common blood type was “O”, followed by “B”, “A”, and “AB”. But the percentages of “O” and “B” phenotype were higher in Purana population than that of the average Sri Lankan population. According to the study done by N.S. De Zoysa in Sri Lanka, blood phenotype distribution in different ethnic groups has been evaluated. According to that study, 45% of Sinhalese had “O” blood group, 27% had “B” blood group, 22% had “A” blood group and only 6% had “AB” blood group. The majority had “O” blood group. But the percentage distribution of blood group phenotype “O” in the Purana population (46%) is higher than the Sinhalese (45%), Tamils (39%), Moor (42%) and Burghers (45%) recorded by N.S. De Zoyza in 1985 (9).

A study done in South India has reported that blood group “O” (38.75%) was the commonest among the participants and followed by group “B” (32.69%), group “A” (18.85%) and “AB” (5.27%) (12). Another study has been done in Ethiopia within a large native ethnic group known as “highlanders” and reported that blood type “O” was the dominant type followed by “A”, “B”, and “AB”. Our study results also more or less similar to those studies conducted in Bangladesh (13), Nigeria (14), and Uganda. (15). The blood groups "O," "A," "B," and "AB" have frequencies of 45%, 41%, 10%, and 4%, respectively, according to a US study, with blood group "O" being the most

common and blood group "AB" being the least common (16).

Another study done in Bangladesh among tribal population showed that blood group “A” is the commonest. This study was similar to the current study as they evaluated the blood group distribution in an isolated tribal community living in Bangladesh and those frequencies were different from the general population in Bangladesh (17). In the current study also the percentages of blood phenotypes are different among Purana community and modern Sri Lankan population.

In contrast, two studies done in Nepal (18) and Egypt indicated that “A” blood group was the dominant phenotype followed by “O”, “B”, and “AB”. Studies done in India (19) and Pakistan (20) showed that blood group “B” is the most prevalent group. Likewise, blood group “A” was dominant in Russian Federation (21). The commonest blood groups in Australians are “O” and “A” while “B” was commonest in Africans (22). In USA, 46% shows group “O”, 41% group “A”, 9% group “B” and 4% group “AB” (23). In Saudi Arabia, 52% is group “O”, 25% group “A”, 19% group “B” and 4% group “AB” (24). According to an Iranian study blood group “O” is reported as the commonest group (41.16%) among them (13). These all studies showed that “A”, “B”, “O” blood group distribution of Purana population is different from other populations in the globe even with modern Sri Lankans. This proves that different geographical locations, ethnicities, different racial origins of the participants even within one country could influence the distribution of ABO blood groups.

When comparing the Rh phenotype distribution of this study with studies in other countries, it was obvious that Rh negative blood which is less common in Purana population (1%) is less common in Africa and Asia as well. In Nigeria only 6% rate was found with Rh negative blood and only 1% in Madagascar (25). In India Rh negativity found to be 0.6- 8.4% in different regions. In China, Indonesia, and Japan Rh negative blood was found less than 1%. In contrast Western countries such as Britain (26) and United stated (23) have a significantly higher percentage of Rh-negative blood of 17% and 15% respectively. A study in Saudi Arabia found that 29% of the population was Rh negative (27).

The genotype distributions in this Purana population were compared with the genotype distribution of present modern Sri Lankans. According to the comparison, AA, AO, BB, BO, AB, OO genotype distributions were 4.8%, 28.6%, 2%, 17.7%, 5.7%, 48% respectively in modern Sri Lankans. Rhesus factor genotype distributions of DD, Dd and dd in present Sri Lankans were 58.8%, 35.7% and 5.5% respectively.

In terms of genotypes, OO genotype in Purana population was 48% while it was 43% in present modern Sri Lankans. Compared to modern Sri Lankans, the Purana population had AO alleles 28.6% higher than 28%. AA alleles was higher (7.3%) in Purana population than other ethnic groups in Sri Lanka (4.8%). BB alleles was the least common genotype in present Sri Lankans (2%) while it was lesser in Purana population (0.2%). BO genotype was higher in present Sri Lankans (17.7%) than that

of 6.4% in Purana population. Genotype percentages of AB alleles were 5.7% and 3.5% in average present Sri Lankans and Purana population respectively.

Rhesus alleles showed a significant difference in distribution as the homogenous dominant variant was more (76%) in Purana population than in the average present Sri Lankans (58.8%). In Purana population, dd alleles were lesser (2%) than the present-day Sri Lankans (5.5%). When Rhesus factor was compared in both the modern Sri Lankans and Purana population, Rh positive blood was the commonest in both groups. While 99% of Purana people had Rh positive blood and 94% of average modern Sri Lankans was reported Rh positive blood (9).

Many studies have investigated about the association between different disease conditions with the ABO blood groups. Some studies reported that patients with osteoarthritis and spinal osteochondrosis had blood group "O" which was in least percentage among other blood types (28). While some studies reported that people with "O" blood group had an increased incident of cholera, plague, mumps, peptic ulcers, and tuberculosis infection (8). This suggests that the Purana community and modern Sri Lankans would have high risk of developing these conditions as the percentage of blood group "O" is higher. The antigens of blood also present in the secretory fluids such as saliva, sweat and semen. Therefore, the secretion of these antigens on different tissues can increase the susceptibility or provide a resistance to various infections and non-infectious diseases. Previous studies suggest that blood group "O" has a protective nature or resistance for venous thromboembolism, pancreatic cancer, severe malaria, but increase the susceptibility for cholera and peptic ulcers. According to the current study Purana population who had highest percentage of blood group "O" will also have the disease resistance for above mentioned diseases (29).

Previous studies have found that individuals with blood group "A", "B" or "AB" are having increased incidence of both arterial and venous thrombotic disease compared to group "O" individuals. This has been described as the higher levels of von Willebrand factor (VWF) can be found in individuals with "A", "B" and "AB" blood groups. Therefore, Purana inhabitants with higher percentage of "O" blood group could have a lower risk of cardiovascular diseases compared to other people in Sri Lanka (30). According to the current study, the pattern of phenotype and genotype distribution of the Purana population is different to the distribution among modern Sri Lankans. With reference to literature, it can be predicted that the majority in this population have risk of developing diseases such as cholera, plague, mumps, peptic ulcers, and tuberculosis infection, but resistant to venous thromboembolism, pancreatic cancer, and severe malaria.

This study proves that the Purana population has different phenotype and genotype blood group distributions than the modern Sri Lankan as well as other ethnic groups in the globe. The study findings will be important in population genetic studies in future researching population migration patterns as well as resolving certain medico-legal issues

such as preventive measures against the diseases which are associated with different blood groups and blood transfusions.

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