Application of Digital Pentapartioned Neutrosophic Set in MCDM for Pregnancy Health Care via Digital Pentapartitioned Neutrosophic Borda Approach

R. Shalini[1], Dr. S. Nagarani[2] and Dr. G. Sindhu[3]
[1]Research Scholar, PG and Research Department of Mathematics,
Nirmala College for Women, Red Fields, Coimbatore, Tamil Nadu, India,
shalinivsk94@gmail.com
[2]Professor, Department of Mathematics,
Sri Ramakrishna Institute of Technology, Coimbatore, Tamil Nadu, India
nagarani.sh@sritcbe.ac.in
[3]Associate Professor, PG and Research Department of Mathematics,
Nirmala College for Women, Red Fields, Coimbatore, Tamil Nadu, India
sindhukannan23@gmail.com

Abstract

In many different domains, neutrosophic sets naturally address uncertainties using a fresh, pretty mathematical technique. Today, it largely and successfully fixes problems in real life. We give a general overview of the Digital Pentapartitioned Neutrosophic Borda Algorithm before going into greater detail about its complexity. The main health problem and the most frequent cause of pregnancy-related health problems in women may be identified by combining borda count with digital pentapartitioned neutrosophic set in digital topological spaces.

Keywords : $Neutro^{sophic\ set}$, $Penta^{partitioned}$ $Neutro^{sophic\ set}$, Digital Pentapartioned $Neutro^{sophic\ set}$, $Penta^{partitioned}$ $Neutro^{sophic\ set}$ borda method.

I. Introduction

During pregnancy, some women have a wide range of health problems that are unexplainable, sometimes occurring with frightening frequency and serious consequences. It appears that these issues frequently have a significant negative impact on the health of the mother or the fetus, sometimes even negatively affecting both. Unexpected obstetric problems during pregnancy can occur in healthy women. Pregnancy may become highly high-risk due to such issues. However, many MCDM methods have already been understood in the uncertainty context. This has led to a great deal of writing regarding fuzzy implementations of different MCDM methodologies, such as intuitionistic fuzzy, soft, grey, rough, or neutrosophic.

The research conducted by Zadeh [32] is predicated on the 1965 proposal to build sets by including deg of member_ship. The development of fuzzy sets resulted in the 1986 development of Atanassov's [2] intuitionistic fuzzy sets. Using three components ($T\check{r}$, $I\check{n}$, $F\check{d}$)= (truth, indeterminacy and falsity), Florentin Smarandache [27] suggested a neutrosophic set in 2005. This set is an extension of intuitionistic fuzzy sets. In 2016, the quadripartitioned single-valued neutrosophic set was first presented by Chatterjee, R. [4]. Quite quietly, in 2020, Surpati Pramanik and Rama Mallick [13] proposed the Pentapartitioned Neutrosophic Set. According to this theory, 5 parameters are: TRUTH ($T\check{r}$), FALSITY ($F\check{d}$), IGNORANCE ($I\check{g}$), CONTRADICTION ($C\check{o}$), and UNKNOWN ($F\check{d}$). Due to their relative fuzziness, their values originate from the interval [0, 1]. Between 0 and 3, they can easily add up to any value. When $T\check{r}$+$I\check{n}$ +$F\check{d}$ is greater than 1, when $T\check{r}$+$C\check{o} + I\check{g} +\ U\check{n} + F\check{d}$ is less than 1. Three values add up to exactly one. Our understanding appears to be complete in some way now that it is fully developed.

The neutrosophic borda method was first presented by Witczak [31] in 2022. The 18th-century mathematician Jean-Charles de Borda is credited with developing the technique. As one might expect, Borda count is a quite diverse family of decision rules that are generally relevant in a variety of situations. But we will only use one of them. The fact that neutrosophic sets offer complex evaluations for every criterion with differing degrees of veracity in some way is the basis for everything.

For every pair of scenarios and criteria, five Borda subranks are systematically calculated based on each neutrosophic logical value. Specifics of computation are determined significantly differently by favorable or unfavorable factors. By simply adding together ranks, we may determine the Borda ranking for a particular pair. To find the rank for all criterion, with the majority of the scenario being blissfully untouched. For such a situation, the Borda number is obtained by gradually and somewhat tediously adding them all together later. To assess all sce_nario based on its Borda_number. Quite often, things are ordered incorrectly. Exceptionally large results are the best.

The 1960's saw the rise of Computer Image Analysis. Rosenfeld [23] proposed further ideas on digital topology fuzzy sets which he claimed where first proposed in 1979. Known as Khalimsky Line, the Digital line is represented by $(\check{Z}, \check{K})$. $\check{U}$ is a subset $\check{K}$ where $\check{x}$- 1 or $\check{x}$+ 1 is contained in $\check{U}$ which is a set of integer values. Topological properties of rectangular shapes determines plane topology in relation to Rosenfeld's [24] fuzzy digital topology ideas. Would $Z^2 = \check{Z} \times \check{Z}$ and $K^2 = \check{K} \times \check{K}$ represent the bounded space. If so, the two sets are called the digital plane.Neutrosophic digital topology, which extends digital topology using neutrosophic sets, was introduced by R. Narmada Devi [10] and her colleagues in 2022. Shalini and Sindhu [25] introduced digital pentapartitioned neutrosophic sets in digital topological spaces in 2024. Shalini and Sindhu introduce the pentapartitioned neutrosophic borda method in 2024 [26].

Researchers introduce the digital pentapartitioned neutrosophic set in digital topological space and they are combine the mathematical model like digital pentapartitioned neutrosophic borda method with the digital pentapartitioned neutrosophic set. Our aim to apply this idea in real life application such as, employing digital pentapartitioned neutrosophic set in digital topological space to determine the major health issue and most common reason for health issue of pregnant womenvia digital pentapartitioned neutrosophic borda method.

II. Preliminary Definitions

Definition: 2.1 $Neutrosophic^{Set}(N^S)$**:** $N^S, \check{E}$ gets defined on universe **ð** with elements characterized by

$$\check{E} = \{< \check{u}, T\check{r}_{\check{A}}(\check{u}), I\check{n}_{\check{A}}(\check{u}), F\check{d}_{\check{A}}(\check{u}) > \check{u} \in ð\}$$

values some what freely within certain bounds. Membership degree$T\check{r}$**,** indeterminacy degree $I\check{n}$ and non-membershipdegree $F\check{d}$ of $\check{u}$ in **ð** are rather vaguely quantified as mappings from **ð**. These mappings push values lies between $\check{0}$ and $\check{3}$, with constraint $\check{0} \leq T\check{r}_{\check{A}}(\check{u}) + I\check{n}_{\check{A}}(\check{u}) + F\check{d}_{\check{A}}(\check{u}) \leq \check{3}$.

Definition: 2.2$Pentapartitioned^{\ Neutrosophic\ Set}(P^{NS})$

$AP^{NS}\check{E}$ gets defined on universe **ð** with elements characterized by

$\check{E} = \left\{< \check{v}, T\check{r}_{\check{E}}(\check{v}), C\check{o}_{\check{E}}(\check{v}), I\check{g}_{\check{E}}(\check{v}), U\check{n}_{\check{E}}(\check{v}), F\check{d}_{\check{E}}(\check{v}) > \check{v} \in ð\right\}$ values somewhat freely withincertain bounds. Truth level - $T\check{r}$**,** Contradiction level - $C\check{o}$, Ignorance level -

$I\check{g}$, Unknown level - $C\check{o}$ and False level - $F\check{a}$ of $\check{v}$ in ð are rather vaguely quantified as mappings from ð. These mappings push values lies between $\check{0}$ and $\check{5}$, with constraint $\check{0} \leq T\check{r}_{\check{E}}(\check{v}) + C\check{o}_{\check{E}}(\check{v}) + I\check{g}_{\check{E}}(\check{v}) + U\check{n}_{\check{E}}(\check{v}) + F\check{a}_{\check{E}}(\check{v}) \leq \check{5}$.

Definition: 2.3 $Digital^{\ Pentapartitioned\ Neutrosophic\ Set}(D^{PNS})$

AD^{PNS} of the form $: \check{E} = \left\{< \check{v}, T\check{r}_{\check{E}}(\check{v}), C\check{o}_{\check{E}}(\check{v}), I\check{g}_{\check{E}}(\check{v}), U\check{n}_{\check{E}}(\check{v}), F\check{a}_{\check{E}}(\check{v}) > \check{v} \in ð\right\}$, mappings from rect_angular int $coordinate^{arrays}$ are lurking somewhere amidst tangled mess of legacy code and obscure documentation. $\check{Z}$ to $[\check{0}, \check{1}]$. Accordingly, these are known as levels of truthiness, inconsistency, lack of information, data absence, and falseness. For each $\check{u} \in \check{Z}$, it is true that $\check{0} \leq \check{T}_{\check{E}}(\check{v}) + C\check{o}_{\check{E}}(\check{v}) + I\check{g}_{\check{E}}(\check{v}) + U\check{n}_{\check{E}}(\check{v}) + F\check{a}_{\check{A}}(\check{v}) \leq \check{5}$.

Definition : 2.4 $Digital^{\ Pentapartitioned\ Neutrosophic\ Topology}(D^{PNT})$

Let $\check{Z}$ stand for int $coordinate^{pts}$ that are grouped into rectangular arrays. The following criteria must be met for a collection $\check{D}$ of P^{NS} within $\check{Z}$ to be considered a D^{PNT} on $\check{Z}$.

i) $\check{0}_{D^{PNS}}$ and $\check{1}_{D^{PNS}}$ are elements of $\check{D}$.

ii) For any $\check{Z}_1, \check{Z}_2 \in \check{D}$, their inter_section $\check{Z}_1 \cap \check{Z}_2$ is also in $\check{D}$.

iii) The union $\cup \check{Z}_i$ belongs to $\check{D}$, for any $arbi^{trary}$ family $\{\check{Z}_i \ / \ iI\} \subseteq \check{D}$.

An example of a D^{PNTS} is the pair $((Z)^{\check{2}}, (D)^{\check{2}})$. A $\check{D}$-open or D^{PNOS} is a member of $\check{D}$, and a D^{PNCS} is the complement of each D^{PNOS}. Every $D^{PN\ Subset}$ of $\check{Z}$ is included in a discrete topology, while only $\check{0}_{D^{PNS}}$ and $\check{1}_{D^{PNS}}$ are included in an indiscrete topology.

Definition: 2.5 $Pentapartitioned^{\ Neutrosophic\ Borda\ Algorithm}(P^{NBA})$

We have $\check{m}$ scenarios rated on $\check{n}$ criteria. Scenarios are denoted by $\check{x}_{\check{1}}$, $\check{x}_{\check{2}}$ and so on up to $\check{x}_{\check{m}}$ and various criteria by $\check{e}_{\check{1}}$, $\check{e}_{\check{2}}$ through $\check{e}_{\check{n}}$ essentially. We obtain our initial decision matrix $[\check{x}_{\check{\imath}\check{\jmath}}]_{\check{m}\times\check{n}}$ having neutrosophic evaluations $\check{x}_{\check{\imath}\check{\jmath}}$ of $(\check{x}_{\check{\imath}})$, relative to criterion $\check{e}_{\check{\jmath}}$ mostly. It has form $\check{T}r_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}})$, $\check{C}o_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), \check{I}g_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), \check{U}n_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), \check{F}a_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}})$ essentially. For any $\check{\imath} \in \{\check{1}...\check{m}\}$ and $\check{\jmath} \in \{\check{1}...\check{n}\}$ we have $T\check{r}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}})$, $C\check{o}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), I\check{g}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), U\check{n}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), \check{F}a_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}) \in [\check{0}, \check{1}]$ and $T\check{r}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}) + C\check{o}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}) + I\check{g}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}) + U\check{n}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}) + \check{F}a_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}})$ is less than or equal to $\check{5}$ pretty much always. Some criteria are favorable and some entail significant unfavorable.

For some arbitrary $\check{\imath}$ in set of first $\check{m}$ natural numbers and $\check{\jmath}$ in first n natural numbers $\check{x}_{\check{\imath}\check{\jmath}}$ equals $T\check{r}_{\check{e}_{\check{\jmath}}}$ of $\check{x}_{\check{\imath}}$ and $C\check{o}_{\check{e}_{\check{\jmath}}}$ of $\check{x}_{\check{\imath}}$ and $I\check{g}_{\check{e}_{\check{\jmath}}}$ of $\check{x}_{\check{\imath}}$ and $U\check{n}_{\check{e}_{\check{\jmath}}}$ of $\check{x}_{\check{\imath}}$ and $F\check{a}_{\check{e}_{\check{\jmath}}}$ of $\check{x}_{\check{\imath}}$. For any, $\check{\imath} \in \{\check{1}...\ \check{m}\}$ and $\check{\jmath} \in \{\check{1}...\ \check{n}\}$ we have

$$\check{x}_{\check{\imath}\check{\jmath}} = (T\check{r}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), C\check{o}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), I\check{g}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), U\check{n}_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}}), \check{F}a_{\check{e}_{\check{\jmath}}}(\check{x}_{\check{\imath}})).$$

We are interested in the final ranking that will allow us to point out the best and the worst solutions. These are the algorithm stepsof the pentapartitioned neutrosophic borda algorithm:

1. For each cri_terion $\check{s}_J$, where $\check{J} \in \{\check{1}... \check{\eta}\}$:

(A) Let, $\check{s}_J$ is an unfavorable cri_terion, now:

i) Order the values $T\check{r}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$ in declining order.

ii) Order the values $C\check{o}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$ in declining order.

iii) Order the values $I\check{g}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$ in upmost order.

iv) Order the values $U\check{n}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$ in upmost order.

v) Order the values $F\check{d}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$, in upmost .

(B) Let, $\check{s}_J$ is a favor_able cri_terion, now:

i) Order the values$T\check{r}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$ in upmost order.

ii) Order the values$C\check{o}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$ in upmost order.

iii) Order the values $I\check{g}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$, in declining order.

iv) Order the values $U\check{n}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$, in declining order.

v) Order the values $F\check{d}_{\check{s}_J}(\check{x}_l), \forall l$ in the scale $\{\check{1}... \check{m}\}$, in declining order.

The rank_value of $\check{x}_l$ in 1st order for any cri_terion known as Bor-da TRUTH-sub_rank of $(\check{x}_{lJ})$ and denoted by $R_{T\check{r}}(\check{x}_{lJ})$. Bor-da CONTRADICTION-sub_rank of $(\check{x}_{lJ})$ of $\check{x}_l$ in the 2nd order, and it is denoted as $R_{C\check{o}}(\check{x}_{lJ})$. Bor-da IGNORANCE-sub_rank of $(\check{x}_{lJ})$ is the rank of $\check{x}_l$ in 3rd order, is denoted by $R_{I\check{g}}(\check{x}_{lJ})$. Bor-da UNKNOWN-sub_rank of $(\check{x}_{lJ})$ is the rank of $\check{x}_l$ in 4th order, is denoted by $R_{U\check{n}}(\check{x}_{lJ})$. Bor-da FALSITY-sub_rank of $(\check{x}_{lJ})$ is the rank of $\check{x}_l$ in 5th order, is denoted by $R_{F\check{d}}(\check{x}_{lJ})$.

For each scenario $\check{x}_l$, $l \in \{\check{1}... \check{m}\}$ and each cri_terion$\check{x}_l, \check{J} \in \{1,....., \check{\eta}\}$) find it's Bor-da Rank: $\mathbf{BR}(\check{x}_{lJ}) = R_{T\check{r}}(\check{x}_{lJ}) + R_{C\check{o}}(\check{x}_{lJ}) + R_{I\check{g}}(\check{x}_{lJ}) + R_{U\check{n}}(\check{x}_{lJ}) + R_{F\check{d}}(\check{x}_{lJ})$.

For each scenario $\check{x}_l$ (where $l \in \{\check{1}... \check{m}\}$) sum of all parameters its Bor-da ranks to 5m to calculate its Bor-da number: $\mathbf{BN}(\check{x}_l) = \sum_{J=1}^{\check{\eta}} \left(5m - BR(\check{x}_{lJ})\right)$.

Order Borda numbers obtained in declining sequence gradually now. Largest numbers showcase best cases impressively.

III. Application of Digital Pentapartioned Neutrosophic Set using Digital Pentapartitioned Neutrosophic Borda Approach

The author's gathered the opinions from 200 pregnant women who visited the primary health centers of two different urban and rural areas in $coimbatore^{city}$ and from four different health issue category with 50 women from each category, to determine the major health issueand find the main reason for health issue of pregnant women at urban/rural area or both. That will helps us to easily find the major health issue and most common reason for health issue of women and minimize the health issue during pregnancy. These are described in more detail below by using digital pentapartitioned neutrosophic sets using digital pentapartitioned neutrosophic borda technique:

Let us assume that the$Universal^{set}$ (U)= $\{\check{1}_{ur}, \check{2}_{ru}\} \times \{\check{1}_{ru}, \check{2}_{ur}\}$ in the digital plane D^2.

Consider all subsets $\check{B}$= {(Υ_{ur},Υ_{ru}), (Υ_{ur}, Z_{ur}),(Z_{ru}, Υ_{ru}), (Z_{ru},Z_{ur})} as an $rectangular^{arrays}$ of int $coordinate^{points}$ of Z^2.

Therefore (Z^2,D^2) is theD^{PNTS}.

Note:

i) (U-Coimbatore City, consider as the $Universal^{set}$ $of\ 2\ different\ urban\ and\ rural\ areas$).
ii) ($\check{B} - Pregnant\ Women\ near\ by\ urban\ and\ rural\ areas$).
iii) ($\check{A} - Category\ of\ most\ common\ health\ issue$).
Assume,$\check{A}$ = {I_1<$T\check{r}, C\check{o}, I\check{g}, U\check{n}, F\check{a}$ >, I_2 <$T\check{r}, C\check{o}, I\check{g}, U\check{n}, F\check{a}$>, I_3 <$T\check{r}, C\check{o}, I\check{g}, U\check{n}, F\check{a}$>, I_4 <$T\check{r}, C\check{o}, I\check{g}, U\check{n}, F\check{a}$>}.
Most common health issues are listed below,
I_1 - Gestational Hypertension
I_2- Gestational Diabetes
I_3- Hypothyroidism
I_4- Anemia
The reasons for the most common health issues during pregnancy that have been found are listed as follows:
R_1 - Nutrition Deficiency
R_2 - Young or old maternal age
R_3 - Exercise and Physical Inactivity
R_4 - Genetic reason
R_5 - Mental Health and Stress Management
R_6 - Obesity
R_7 - Pre-existing Medical Conditions
R_8 - Lifestyle Factors
R_9 - Infections
R_{10}- Being pregnant with twins/triplets.

$D^{PNS's}$ are framed in various digital topological spaces and presented mostly in tabular form according opinions of respondents.

After collecting the numerical values of four major health issues from the different urban and rural areas of pregnant women. Each response was converted into five components: Truth, Contradiction, Ignorance, Unknown and Falsity. This procedure allowed the formation of a Pentapartitioned Neutrosophic Set for each pregnancy health care suggestion under each group. The $D^{PNS's}$ framework helps us to clearly understand and find the most common reason for major health issue from their ratings. The table below shown these evaluations for all ten reasons (R_1,..., R_{10}) across the four health issues (I_1 ... I_4).

Let us execute our algorithm steps. Similarly, we use the below shortcut for$T\check{r}, C\check{o}, I\check{g}, U\check{n}, F\check{a}$.

Scenario / Criterion	I_1	I_2	I_3	I_4
R_1	(0.5,0,0.1,0.1,0.8)	(0.7,0,0.1,0.2,0.8)	(0.8,0,0.2,0,0.1)	(0.9,0,0.1,0.7,0.3)

R_2	(0,0,0.2,0.2,0.6)	(0,0,0.1,0.1,0.8)	(0,0,0.1,0.1,0.8)	(0.2,0,0.2,0.2,0.6)
R_3	(0,0,0.1,0.2,0.7)	(0,0,0.2,0.3,0.5)	(0,0,0.2,0,3,0.5)	(0.5,0,0.2,0.5,0.3)
R_4	(0.1,0,0.1,0.1,0.7)	(0.2,0,0.1,0.1,0.6)	(0,0,0.2,0.4,0.6)	(0.4,0,0.1,0.3,0.7)
R_5	(0.5,0,0.1,0.1,0.3)	(0,0,0.3,0.3,0.4)	(0,0,0.1,0.4,0.5)	(0,0,0.5,0.3,0.2)
R_6	(0,0,0.4,0.2,0.4)	(0.5,0,0,0.3,0.2)	(0,0,0.2,0.3,0.5)	(0,0,0.2,0.2,0.3)
R_7	(0.4,0,0.1,0.2,0.2)	(0,0,0.3,0.2,0.5)	(0,0,0.3,0.4,0.3)	(0.1,0,0.2,0.5,0.3)
R_8	(0,0,0.1,0.2,0.7)	(0,0,0.2,0.1,0.7)	(0,0,0.2,0.3,0.5)	(0.1,0,0.1,0.1,0.8)
R_9	(0,0,0.3,0.3,0.4)	(0,0,0.2,0.2,0.6)	(0,0,0.4,0.4,0.2)	(0,0,0.3,0.2,0.5)
R_{10}	(0,0,0.2,0.2,0.6)	(0,0,0.1,0.3,0.6)	(0.5,0,0.2,0.1,0.1)	(0,0,0.1,0.2,0.7)

1. Take I_1. Let it is favor_able cri_terion, then:

1. $\check{Tr}(R\check{I}_{21})$=$\check{Tr}(R\check{I}_{31})$=$\check{Tr}(R\check{I}_{61})$= $\check{Tr}(R\check{I}_{81})$= $\check{Tr}(R\check{I}_{91})$= $\check{Tr}(R\check{I}_{10_1})$= 0, **2.** $\check{Tr}(R\check{I}_{41})$= 0.1, **3.**$\check{Tr}(R\check{I}_{71})$= 0.4, 4.$\check{Tr}(R\check{I}_{11})$= $\check{Tr}(R\check{I}_{51})$= 0.5.

1. $\check{Co}(R\check{I}_{11})$ = $\check{Co}(R\check{I}_{21})$= $\check{Co}(R\check{I}_{31})$=$\check{Co}(R\check{I}_{41})$= $\check{Co}(R\check{I}_{51})$=$\check{Co}(R\check{I}_{61})$ =$\check{Co}(R\check{I}_{71})$=$\check{Co}(R\check{I}_{81})$=$\check{Co}(R\check{I}_{91})$=$\check{Co}(R\check{I}_{10_1})$= 0.

1. $\check{Ig}(R\check{I}_{61})$ = 0.4, 2.$\check{Ig}(R\check{I}_{91})$ = 0.3,3.$\check{Ig}(R\check{I}_{21})$ = $\check{Ig}(R\check{I}_{10_1})$ = 0.2,4.$\check{Ig}(R\check{I}_{11})$ = $\check{Ig}(R\check{I}_{31})$=$\check{Ig}(R\check{I}_{41})$= $\check{Ig}(R\check{I}_{51})$=$\check{Ig}(R\check{I}_{71})$=$\check{Ig}(R\check{I}_{81})$= 0.1.

1. $\check{Un}(R\check{I}_{91})$=0.3, 2.$\check{Un}(R\check{I}_{21})$ = $\check{Un}(R\check{I}_{31})$ = $\check{Un}(R\check{I}_{61})$ = $\check{Un}(R\check{I}_{71})$ = $\check{Un}(R\check{I}_{81})$ = $\check{Un}(R\check{I}_{10_1})$ = 0.2,3.$\check{Un}(R\check{I}_{11})$ = $\check{Un}(R\check{I}_{41})$=$\check{Un}(R\check{I}_{51})$= 0.1.

1. $\check{Fa}(R\check{I}_{11})$ = 0.8, **2.**$\check{Fa}(R\check{I}_{31})$= $\check{Fa}(R\check{I}_{41})$=$\check{Fa}(R\check{I}_{81})$= 0.7,
3. $\check{Fa}(R\check{I}_{21})$=$\check{Fa}(R\check{I}_{10_1})$= 0.6, **4.**$\check{Fa}(R\check{I}_{61})$= $\check{Fa}(R\check{I}_{91})$= 0.4, **5.**$\check{Fa}(R\check{I}_{51})$= 0.3, **6.**$\check{Fa}(R\check{I}_{71})$ = 0.2.

Thus we have the following,
$Digital^{PentapartitionedNeutrosophic\ Borda\ Ranks}(D^{PNBR's})$:
$DPNBR^{\vee}(R\check{I}_{11}) = \check{Tr}(R\check{I}_{11}) + \check{Co}(R\check{I}_{11}) + \check{Ig}(R\check{I}_{11}) + \check{Un}(R\check{I}_{11}) + \check{Fa}(R\check{I}_{11})$

= 4+1+4+3+1 = 13

In the above similar manner, we can find the remaining,

$DPNBR^{\vee}(R\check{I}_{21})$ = 1 + 1 + 3 + 2 + 3 = 10
$DPNBR^{\vee}(R\check{I}_{31})$ = 1 + 1 + 4 + 2 + 2 = 10
$DPNBR^{\vee}(R\check{I}_{41})$ = 2 + 1 + 4 + 3 + 2 = 12
$DPNBR^{\vee}(R\check{I}_{51})$ = 4 + 1 + 3 + 3 + 5 = 16
$DPNBR^{\vee}(R\check{I}_{61})$ = 1+ 1 + 1 + 1 + 4 = 8
$DPNBR^{\vee}(R\check{I}_{71})$ = 3 + 1 + 4 + 2 + 6 = 16
$DPNBR^{\vee}(R\check{I}_{81})$ = 1 + 1 + 4 + 2 + 4 = 10
$DPNBR^{\vee}(R\check{I}_{91})$ = 1 + 1 + 2 + 1 + 4 = 9
$DPNBR^{\vee}(R\check{I}_{10_1})$ = 1 + 1 + 3 + 2 + 3 = 10.

2. Take I_2.This is the favorable Criterion, then we have the following arrangements:

1. $\check{Tr}(R\check{I}_{22})$= $\check{Tr}(R\check{I}_{32})$=$\check{Tr}(R\check{I}_{52})$=$\check{Tr}(R\check{I}_{72})$= $\check{Tr}(R\check{I}_{82})$= $\check{Tr}(R\check{I}_{92})$= $\check{Tr}(R\check{I}_{10_2})$= 0, **2.**$\check{Tr}(R\check{I}_{42})$= 0.2, 3.$\check{Tr}(R\check{I}_{62})$ = 0.5, **4.** $\check{Tr}(R\check{I}_{12})$ = 0.7.

1. $\check{Co}(R\check{I}_{12})$ = $\check{Co}(R\check{I}_{22})$= $\check{Co}(R\check{I}_{32})$=$\check{Co}(R\check{I}_{42})$= $\check{Co}(R\check{I}_{52})$ = $\check{Co}(R\check{I}_{62})$=$\check{Co}(R\check{I}_{72})$=$\check{Co}(R\check{I}_{82})$=$\check{Co}(R\check{I}_{92})$=$\check{Co}(R\check{I}_{10_2})$= 0.

1. $\check{Ig}(R\check{I}_{52})$ = $\check{Ig}(R\check{I}_{72})$ = 0.3, **2.**$\check{Ig}(R\check{I}_{32})$=$\check{Ig}(R\check{I}_{82})$= $\check{Ig}(R\check{I}_{92})$ = 0.2,

3. $Ig^{\vee}(RI^{\vee}_{12})$ =$Ig^{\vee}(RI^{\vee}_{22})$= $Ig^{\vee}(RI^{\vee}_{42})$=$Ig^{\vee}(RI^{\vee}_{10_2})$= 0.1,**4.**$Ig^{\vee}(RI^{\vee}_{62})$= 0.
1. $Un^{\vee}(RI^{\vee}_{32})$=$Un^{\vee}(RI^{\vee}_{52})$ = $Un^{\vee}(RI^{\vee}_{62})$=$Un^{\vee}(RI^{\vee}_{10_2})$= 0.3, **2.**$Un^{\vee}(RI^{\vee}_{12})$= $Un^{\vee}(RI^{\vee}_{72})$= $Un^{\vee}(RI^{\vee}_{92})$ = 0.2, **3.**$Un^{\vee}(RI^{\vee}_{22})$ =$Un^{\vee}(RI^{\vee}_{42})$=$Un^{\vee}(RI^{\vee}_{82})$= 0.1.
1. $Fa^{\vee}(RI^{\vee}_{12})$= $Fa^{\vee}(RI^{\vee}_{22})$ = 0.8, **2.**$Fa^{\vee}(RI^{\vee}_{82})$= 0.7, **3.**$Fa^{\vee}(RI^{\vee}_{42})$=$Fa^{\vee}(RI^{\vee}_{92})$ = $Fa^{\vee}(RI^{\vee}_{10_2})$= 0.6, **4.**$Fa^{\vee}(RI^{\vee}_{32})$=$Fa^{\vee}(RI^{\vee}_{72})$= 0.5, **5.**$Fa^{\vee}(RI^{\vee}_{52})$= 0.4,
6.$Fa^{\vee}(RI^{\vee}_{62})$ = 0.2,

Thus we have the following,$D^{PNBR's}$:

$$DPNBR^{\vee}(RI^{\vee}_{12}) = Tr^{\vee}(RI^{\vee}_{12}) + Co^{\vee}(RI^{\vee}_{12}) + Ig^{\vee}(RI^{\vee}_{12}) + Un^{\vee}(RI^{\vee}_{12}) + Fa^{\vee}(RI^{\vee}_{12})$$

= 4+1+3+2+1 = 11

In the above similar manner, we can find the remaining,

$DPNBR^{\vee}(RI^{\vee}_{22})$ = 1 + 1 + 3+ 3 + 1 = 9
$DPNBR^{\vee}(RI^{\vee}_{32})$ = 1 + 1 + 2 + 1 + 4 = 9
$DPNBR^{\vee}(RI^{\vee}_{42})$ = 2 + 1 + 3 + 3 + 3 = 12
$DPNBR^{\vee}(RI^{\vee}_{52})$ = 1 + 1 + 1 + 1 + 1 = 9
$DPNBR^{\vee}(RI^{\vee}_{62})$ = 3 + 1 + 4 + 1+ 6 = 15
$DPNBR^{\vee}(RI^{\vee}_{72})$ = 1 + 1 + 1 + 2 + 4 = 9
$DPNBR^{\vee}(RI^{\vee}_{82})$ = 1 + 1 + 2 + 3 + 2 = 9
$DPNBR^{\vee}(RI^{\vee}_{92})$ = 1 + 1 + 2 + 2 + 3 = 9
$DPNBR^{\vee}(RI^{\vee}_{10_2})$ = 1 + 1 + 3 + 1 + 3 = 9.

3. Take I_3.This is the unfavorable Criterion, then we have the following arrangements:

1.$Tr^{\vee}(RI^{\vee}_{13})$ = 0.8, **2.**$Tr^{\vee}(RI^{\vee}_{10_3})$= 0.5, **3.**$Tr^{\vee}(RI^{\vee}_{23})$=$Tr^{\vee}(RI^{\vee}_{33})$= $Tr^{\vee}(RI^{\vee}_{43})$=$Tr^{\vee}(RI^{\vee}_{53})$=$Tr^{\vee}(RI^{\vee}_{63})$= $Tr^{\vee}(RI^{\vee}_{73})$= $Tr^{\vee}(RI^{\vee}_{83})$= $Tr^{\vee}(RI^{\vee}_{93})$= 0.
1.$Co^{\vee}(RI^{\vee}_{13})$ = $Co^{\vee}(RI^{\vee}_{23})$= $Co^{\vee}(RI^{\vee}_{33})$=$Co^{\vee}(RI^{\vee}_{43})$= $Co^{\vee}(RI^{\vee}_{53})$=$Co^{\vee}(RI^{\vee}_{63})$=$Co^{\vee}(RI^{\vee}_{73})$=$Co^{\vee}(RI^{\vee}_{83})$=$Co^{\vee}(RI^{\vee}_{93})$=$Co^{\vee}(RI^{\vee}_{10_3})$= 0.
1. $Ig^{\vee}(RI^{\vee}_{23})$ = $Ig^{\vee}(RI^{\vee}_{53})$= 0.1, **2.**$Ig^{\vee}(RI^{\vee}_{13})$= $Ig^{\vee}(RI^{\vee}_{33})$=$Ig^{\vee}(RI^{\vee}_{43})$=$Ig^{\vee}(RI^{\vee}_{63})$ =$Ig^{\vee}(RI^{\vee}_{83})$= $Ig^{\vee}(RI^{\vee}_{10_3})$ = 0.2, **3.**$Ig^{\vee}(RI^{\vee}_{73})$= 0.3, **4.**$Ig^{\vee}(RI^{\vee}_{93})$ = 0.4.
1. $Un^{\vee}(RI^{\vee}_{13})$ = 0, **2.**$Un^{\vee}(RI^{\vee}_{23})$=$Un^{\vee}(RI^{\vee}_{10_3})$= 0.1, **3.**$Un^{\vee}(RI^{\vee}_{33})$=$Un^{\vee}(RI^{\vee}_{63})$ =$Un^{\vee}(RI^{\vee}_{83})$= 0.3, **4.**$Un^{\vee}(RI^{\vee}_{43})$=$Un^{\vee}(RI^{\vee}_{53})$= $Un^{\vee}(RI^{\vee}_{73})$= 0.2 =$Un^{\vee}(RI^{\vee}_{93})$ = 0.4.
1. $Fa^{\vee}(RI^{\vee}_{13})$ =$Fa^{\vee}(RI^{\vee}_{10_3})$= 0.1, **2.**$Fa^{\vee}(RI^{\vee}_{93})$= 0.2, **3.**$Fa^{\vee}(RI^{\vee}_{73})$= 0.3,
4.$Fa^{\vee}(RI^{\vee}_{33})$=$Fa^{\vee}(RI^{\vee}_{53})$=$Fa^{\vee}(RI^{\vee}_{63})$= $Fa^{\vee}(RI^{\vee}_{83})$= 0.5, **5.**$Fa^{\vee}(RI^{\vee}_{43})$= 0.6,
6.$Fa^{\vee}(RI^{\vee}_{23})$ = 0.8,

Thus we have the following, $D^{PNBR's}$:

$$DPNBR^{\vee}(RI^{\vee}_{13}) = Tr^{\vee}(RI^{\vee}_{13}) + Co^{\vee}(RI^{\vee}_{13}) + Ig^{\vee}(RI^{\vee}_{13}) + Un^{\vee}(RI^{\vee}_{13}) + Fa^{\vee}(RI^{\vee}_{13})$$

= 1+1+2+1+1 = 6

In the above similar manner, we can find the remaining,

$DPNBR^{\vee}(RI^{\vee}_{23})$ = 3 + 1 + 1 + 2 + 6 = 13
$DPNBR^{\vee}(RI^{\vee}_{33})$ = 3 + 1 + 2 + 3 + 4 = 13
$DPNBR^{\vee}(RI^{\vee}_{43})$ = 3 + 1 + 2 + 4 + 5 = 15
$DPNBR^{\vee}(RI^{\vee}_{53})$ = 3 + 1 + 1 + 4 + 4 = 13

$$DPNBR^{\check{}}(R\check{I}_{63}) = 3 + 1 + 2 + 3 + 4 = 13$$
$$DPNBR^{\check{}}(R\check{I}_{73}) = 3 + 1 + 3 + 4 + 3 = 14$$
$$DPNBR^{\check{}}(R\check{I}_{83}) = 3 + 1 + 2 + 3 + 4 = 13$$
$$DPNBR^{\check{}}(R\check{I}_{93}) = 3 + 1 + 4 + 4 + 2 = 14$$
$$DPNBR^{\check{}}(R\check{I}_{10_3}) = 2 + 1 + 2 + 2 + 1 = 8.$$

4. Take I_4.This is the unfavorable Criterion, then we have the following declining arrangements:

1. $Tr^{\check{}}(R\check{I}_{14}) = 0.9$, **2.**$Tr^{\check{}}(R\check{I}_{34}) = 0.5$, **3.**$Tr^{\check{}}(R\check{I}_{44}) = 0.4$, **4.**$Tr^{\check{}}(R\check{I}_{24}) = 0.2$, **5.**$Tr^{\check{}}(R\check{I}_{74}) = Tr^{\check{}}(R\check{I}_{84}) = 0.1$, 6. $Tr^{\check{}}(R\check{I}_{54}) = Tr^{\check{}}(R\check{I}_{64}) = Tr^{\check{}}(R\check{I}_{94}) = Tr^{\check{}}(R\check{I}_{10_4}) = 0$.

1. $Co^{\check{}}(R\check{I}_{14}) = Co^{\check{}}(R\check{I}_{24}) = Co^{\check{}}(R\check{I}_{34}) = Co^{\check{}}(R\check{I}_{44}) = Co^{\check{}}(R\check{I}_{54}) = Co^{\check{}}(R\check{I}_{64}) = Co^{\check{}}(R\check{I}_{74}) = Co^{\check{}}(R\check{I}_{84}) = Co^{\check{}}(R\check{I}_{94}) = Co^{\check{}}(R\check{I}_{10_4}) = 0$.

1. $Ig^{\check{}}(R\check{I}_{14}) = Ig^{\check{}}(R\check{I}_{44}) = Ig^{\check{}}(R\check{I}_{84}) = Ig^{\check{}}(R\check{I}_{10_4}) = 0.1$, **2.** $Ig^{\check{}}(R\check{I}_{24}) = Ig^{\check{}}(R\check{I}_{34}) = Ig^{\check{}}(R\check{I}_{64}) = Ig^{\check{}}(R\check{I}_{74}) = 0.2$, **3.**$Ig^{\check{}}(R\check{I}_{94}) = 0.3$,

4. $Ig^{\check{}}(R\check{I}_{54}) = 0.5$.

1. $Un^{\check{}}(R\check{I}_{84}) = 0.1$, **2.**$Un^{\check{}}(R\check{I}_{24}) = Un^{\check{}}(R\check{I}_{64}) = Un^{\check{}}(R\check{I}_{94}) = Un^{\check{}}(R\check{I}_{10_4}) = 0.2$,

3. $Un^{\check{}}(R\check{I}_{44}) = Un^{\check{}}(R\check{I}_{54}) = 0.3$, **4.**$Un^{\check{}}(R\check{I}_{34}) = Un^{\check{}}(R\check{I}_{74}) = 0.5$, **5.**$Un^{\check{}}(R\check{I}_{14}) = 0.7$.

1. $Fa^{\check{}}(R\check{I}_{54}) = 0.2$, **2.**$Fa^{\check{}}(R\check{I}_{14}) = Fa^{\check{}}(R\check{I}_{34}) = Fa^{\check{}}(R\check{I}_{64}) = Fa^{\check{}}(R\check{I}_{74}) = 0.3$,

3. $Fa^{\check{}}(R\check{I}_{94}) = 0.5$, **4.**$Fa^{\check{}}(R\check{I}_{24}) = 0.6$, **5.**$Fa^{\check{}}(R\check{I}_{44}) = Fa^{\check{}}(R\check{I}_{10_4}) = 0.7$,

6. $Fa^{\check{}}(R\check{I}_{84}) = 0.8$.

Thus we have the following, $D^{PNBR's}$:

$$DPNBR^{\check{}}(R\check{I}_{14}) = Tr^{\check{}}(R\check{I}_{14}) + Co^{\check{}}(R\check{I}_{14}) + Ig^{\check{}}(R\check{I}_{14}) + Un^{\check{}}(R\check{I}_{14}) + Fa^{\check{}}(R\check{I}_{14})$$

$$= 1+1+1+5+2 = 10$$

In the above similar manner, we can find the remaining,

$$DPNBR^{\check{}}(R\check{I}_{24}) = 4 + 1 + 2 + 2 + 4 = 13$$
$$DPNBR^{\check{}}(R\check{I}_{34}) = 2 + 1 + 2 + 4 + 2 = 11$$
$$DPNBR^{\check{}}(R\check{I}_{44}) = 3 + 1 + 1 + 3 + 5 = 13$$
$$DPNBR^{\check{}}(R\check{I}_{54}) = 6 + 1 + 4 + 3 + 1 = 15$$
$$DPNBR^{\check{}}(R\check{I}_{64}) = 6 + 1 + 2 + 2 + 2 = 13$$
$$DPNBR^{\check{}}(R\check{I}_{74}) = 5 + 1 + 2 + 4 + 2 = 14$$
$$DPNBR^{\check{}}(R\check{I}_{84}) = 5 + 1 + 1 + 1 + 6 = 14$$
$$DPNBR^{\check{}}(R\check{I}_{94}) = 6 + 1 + 3 + 2 + 3 = 15$$
$$DPNBR^{\check{}}(R\check{I}_{10_4}) = 6 + 1 + 1 + 2 + 5 = 15.$$

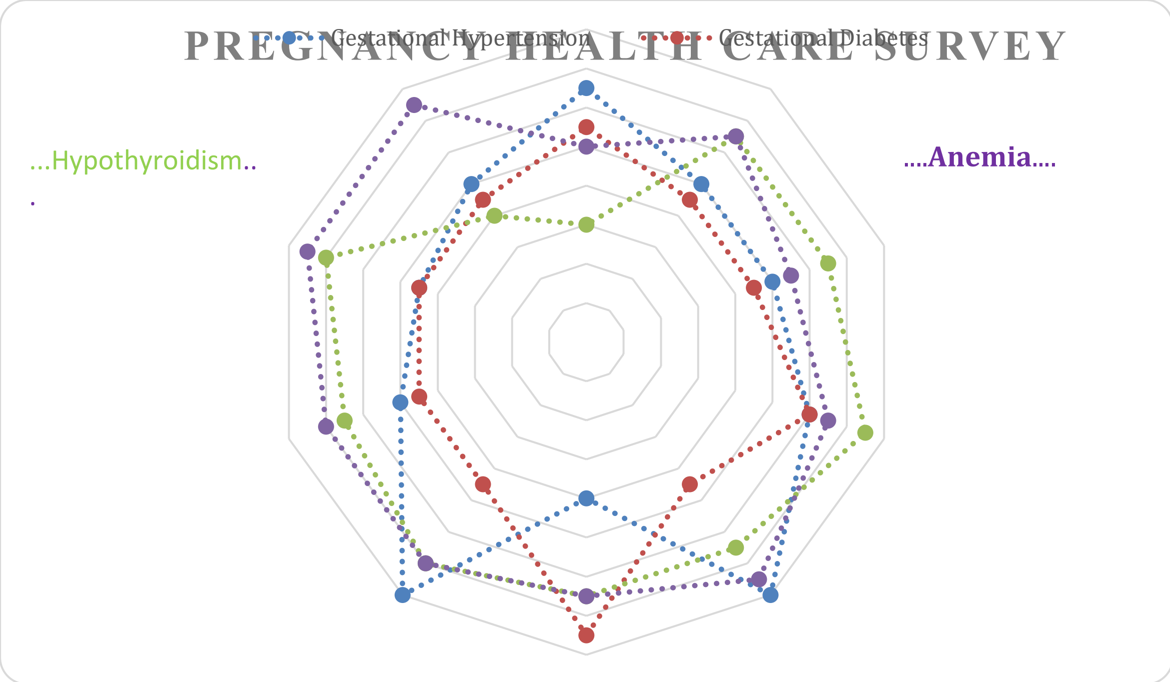

Fig. 1: Radar chart shows that Borda Rank for major health issues of pregnancy

From the above radar chart we can easily find out the most common health issue amongst the four major health issues during pregnancy by using the Digital Pentapartitioned neutrosophic health survey ie., **Anemia** is the most common health during pregnancyof women who belongs from both urban and rural areas.

5. Next to find the Digital Pentapartitioned Neutrosophic Borda Numbers:

$$DPN\check{B}(R\check{I}_i) = \sum_{j=1}^{n} \quad 5\check{m} - B\check{R}(x_{ij})$$

$DPN\check{B}(R\check{I}_1)$ = (50-13) + (50-11) + (50-6) + (25-10)
= 37 + 39 + 46 + 40
$DPN\check{B}(R\check{I}_1)$ = **162**.

$DPN\check{B}(R\check{I}_2)$ = (50-10) + (50-9) + (50-13) + (50-13)
= 40 + 41+ 37 + 37
$DPN\check{B}(R\check{I}_2)$ = **155**.

$DPN\check{B}(R\check{I}_3)$ = (50-10) + (50-9) + (50-13) + (50-11)
= 40 + 41+ 37 + 39
$DPN\check{B}(R\check{I}_3)$ = **157**.

$DPN\check{B}(R\check{I}_4)$ = (50-12) + (50-12) + (50-13) + (50-13)
= 38 + 38+ 37 + 37
$DPN\check{B}(R\check{I}_4)$ = **150**.

$DPN\check{B}(R\check{I}_5)$ = (50-16) + (50-9) + (50-13) + (50-15)
= 34 + 41+ 37 + 35

$DPN\check{B}(R\check{I}_5)$ = **147**.

$DPN\check{B}(R\check{I}_6)$ = (50-8) + (50-15) + (50-13) + (50-13)
= 42 + 35+ 37 + 37
$DPN\check{B}(R\check{I}_6)$ = **151**.

$DPN\check{B}(R\check{I}_7)$ = (50-16) + (50-9) + (50-14) + (50-14)
= 34 + 41+ 36 + 36
$DPN\check{B}(R\check{I}_7)$ **= 147.**

$DPN\check{B}(R\check{I}_8)$ = (50-10) + (50-9) + (50-13) + (50-14)
= 40 + 41+ 37 + 36
$DPN\check{B}(R\check{I}_8)$ **= 154.**

$DPN\check{B}(R\check{I}_9)$ = (50-9) + (50-9) + (50-14) + (50-15)
= 41 + 41+ 36 + 35
$DPN\check{B}(R\check{I}_9)$ **= 153.**

$DPN\check{B}(R\check{I}_{10})$ = (50-10) + (50-9) + (50-8) + (50-15)
= 40 + 41+ 42 + 35
$DPN\check{B}(R\check{I}_{10})$ **= 158.**

Now, let us sort $D^{PNBN's}$in declining order:

$DPN\check{B}(R\check{I}_1)$ = **162**, $DPN\check{B}(R\check{I}_{10})$ = **158**,$DPN\check{B}(R\check{I}_3)$ = **157**, $DPN\check{B}(R\check{I}_2)$ = **155,** $DPN\check{B}(R\check{I}_8)$ = **154**,$DPN\check{B}(R\check{I}_9)$ = **153**, $DPN\check{B}(R\check{I}_6)$ = **151**, $DPN\check{B}(R\check{I}_4)$ = **150**, $DPN\check{B}(R\check{I}_5)$ = $DPN\check{B}(R\check{I}_7)$ = **147.**

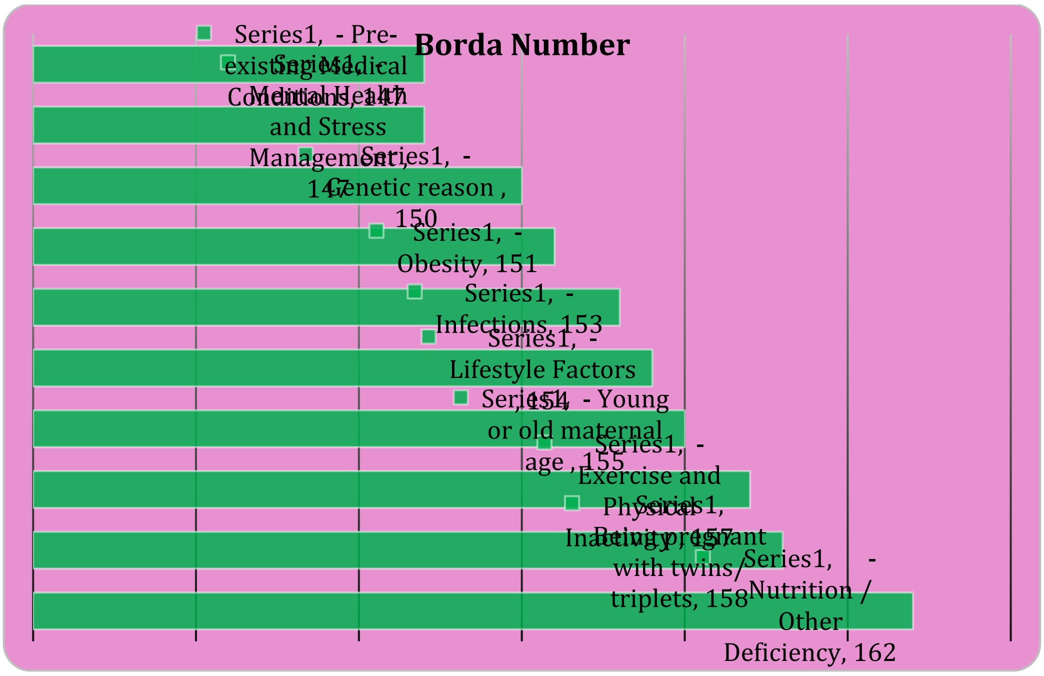

Fig. 2: Chart shows that Borda Number for major health issues reason of pregnancy.

From the above chart we can easily find out the most common reason for the major health issues amongst the ten common reasons during pregnancy by using the Digital Pentapartitioned neutrosophic health survey ie., "**Nutrition / Other Deficiency"** is the most common reason during pregnancy of women who belongs from both urban and rural areas.

The best common scenario is$(\check{RI}_1)$ and the worst scenario is $(\check{RI}_5)$ & $(\check{RI}_7)$.

The highest score in this case is **162. (i.e., Nutrition / Other Deficiency).**

IV. Results and Conclusion

The results of the D^{PNS} borda method reveal that $(\check{RI}_1)$ is the most scenario, receiving the highest score of 162. This suggests that pregnant women place significant importance on protecting their major health issue (**Anemia** from radar chart) from the most common reason **Nutrition / Other Deficiency**.

Therefore,**" Nutrition / Other Deficiency"** is the best solution for pregnant women who are affecting from major health issue **Anemia**, according to this study and survey.

In order to determine the optimal reason for major health issues of pregnancy available to pregnant women, the authors of this paper present and create a mathematical model utilizing the digital pentapartitioned neutrosophic sets in pentapartitioned neutrosophic borda technique.

References

1. A.A.A. Agboola ans B. Davvaz., Introduction to neutrosophic BCI / BCK-algebra, International Journal of Mathematics and Mathematical Sciences, 1(2015), pp. 1-6.
2. K.T. Atanassov., Intuitionistic Fuzzy Sets. Fuzzy Sets and System, 20, (1986), pp. 87-96.
3. C.L. Chang., Fuzzy topological spaces, J. Math. Anal. Appl., 24, (1968), pp. 182–190.
4. R. Chatterjee, P. Majumdar, S.K. Samanta, On some similarity measures and entropy on quadripartithioned single-valued neutrosophic sets, J. Int. Fuzzy Syst., 30,(2016), pp. 2475–2485.
5. D. Coker., An introduction to intuitionistic fuzzy topological spaces, Fuzzy Sets and System, 88, (1997), pp. 81 - 89.
6. S. Das, R. Das and B.C. Tripathy, Multi-criteria group decision making model using single valued neutrosophic set. LogForum, 16 (3), (2020), pp. 421-429.
7. R.N. Devi, R. E. Roja and M. Sudha., Compactness and connectedness in vague fuzzy digital bi-structure space, International Journal of Mathematics and Computer Applications Research,3 (4), (2013), pp. 19 - 30.
8. R.N. Devi, E. Roja and M.K. Uma., on homotopy and contractibility in vague fuzzy digital structure spaces. The Journal of Fuzzy Mathematics, 22 (4), (2014), pp. 771 - 790.
9. R.N. Devi, E. Roja, and M.K. Uma., on pairwise K-connectedness, pairwise K-disconnectedness and pairwise K-compactness in vague fuzzy digital bi-structure spaces. Annals of Fuzzy Mathematics and Informatics, 9 (2), (2015), pp. 215 - 233.
10. R.N. Devi et.all, "Novel on Digital Neutrosophic Topological Spaces", conf. proceeding on Mathematical modeling and Computational Sciences, pp. 213 – 219, 2022.
11. R. Lowen., Fuzzy topological spaces and fuzzy compactness, J. Math. Anal. Appl., 56, (1976), pp. 621 - 633.
12. P.K. Maji, Neutrosophic soft set, Annals of Fuzzy Mathematics and Informatics, Volume 5(1), (2013), pp. 157-168.
13. R. Mallick and S. Pramanik., Pentapartitioned neutrosophicset and its properties, Neutrosophic Sets and Systems, 36, (2020), pp. 184-192.
14. D. Molodtsov, Soft set Theory - First Results, Computers and Mathematics with Applications, 37 (1999), pp. 19-31.
15. K. Mondal, S. Pramanik andB.C. Giri, Single valued neutrosophic hyperbolic sine similarity measure based MADM strategy. Neutrosophic Sets and Systems, 20, (2018), pp. 3-11.
16. S. Pramanik, S. Dalapati, S. Alam and T.K. Roy, NC-VIKOR-based MAGDM strategy under neutrosophic cubic set environment. Neutrosophic Sets and Systems, 20, (2018), pp. 95-108.
17. S. Pramanik,R. Mallick and A. Dasgupta, Contributions of Selected Indian researchers to multi-attribute decision making in the neutrosophic environment: An overview. Neutrosophic Sets and Systems, 20, (2018), pp. 109-130.
18. S. Pramanik andR. Mallick, VIKOR-based MAGDM strategy with trapezoidal neutrosophic

numbers. Neutrosophic Sets and Systems, 22, (2018), pp. 118-130.
19. P.M. Pu and Y.M. Liu., Fuzzy topology, I, Neighbourhood structure of a fuzzy point an Moore-Smith convergence, J. Math. Anal. Appl., 76, (1980), pp. 571 - 599.
20. R. Radha, A.M. Stanis, Heptapartitioned neutrosophic sets, IRJCT, 2 (2020), pp. 222-230.
21. R. Radha, A.M. Stanis, Quadripartitioned neutrosophic Pythagorean sets, International Journal of Research Publication and Reviews, 2 (4), (2020), pp. 276-281.
22. A. Rosenfeld, Fuzzy groups. Journal of Mathematical Analysis and Applications, 35(3), (1971), pp. 512-517.
23. A. Rosenfeld., Fuzzy digital topology, Information and Control, 40, (1979), pp. 76 - 87.
24. A. Rosenfeld., Digital Topology, Amer. Math., 86, (1979), pp. 621-630.
25. R. Shalini and G. Sindhu., An Introduction to Digital Pentapartitioned Neutrosophic Sets in Digital Topological Space, International Journal of All Research Education and Scientific Methods, 12(12), (2024), pp. 3390-3397.
26. R. Shalini., G. Sindhu., “Alternatives Open to Working Women’s for Infertility – A Mathematical Model Using the Pentapartitioned Neutrosophic Borda Method”, Journal of Propulsion Technology, 45(2), 2024.
27. F. Smarandache., Neutrosophic set: a generalization of the intuitionistic fuzzy sets, International Journal of Pure and Applied Mathematics, 24, (2005), pp. 287-297.
28. F. Smarandache., n-Valued Refined Neutrosophic Logic and Its Applications in Physics, Progress in Physics, 4, (2013), pp. 143-146.
29. F. Smarandache, M. Mohamed and M. Voskoglou, Evaluating Blockchain Cybersecurity Based on Tree Soft and Opinion Weight Criteria Method under Uncertainty Climate, HyperSoft Set Methods inEngineering,1 (2024),pp.1-10.
30. H. Wang, F. Smarandache, Y. Zhang and R. Sunderraman, Single valued neutrosophic sets, Multi-space and Multistructure, 4 (2010), pp. 410-413.
31. T. Witczak, Neutrosophic Borda method, International Journal of neutrosophic science, 19(01), (2022), pp. 242-249.
32. L. A. Zadeh., Fuzzy set, Information and Control, 8, (1965), pp. 338-353.