

APPENDICES

Appendix 1: Single letter abbreviation code for amino acids

i) Alanine (A)	xi) Methionine (M)
ii) Cysteine (C)	xii) Asparagine (N)
iii) Aspartic acid (D)	xiii) Proline (P)
iv) Glutamic acid (E)	xiv) Glutamine (Q)
v) Phenylalanine (F)	xv) Arginine (R)
vi) Glycine (G)	xvi) Serine (S)
vii) Histidine (H)	xvii) Threonine (T)
viii) Isoleucine (I)	xviii) Valine (V)
ix) Lysine (K)	xix) Tryptophan (W)
x) Leucine (L)	xx) Tyrosine (Y)

Appendix 2: Schedule for peptide synthesis generated by the Pepmaker Programme from Chiron. An overall aspect of the synthesis together with worksheet for Day 1 is shown.

GENERAL NET SYNTHESIS SCHEDULE NUMBER : 9

Page 1

Description: No description entered yet

10-mer peptides based on the sequence EA-R19~1.ASC
Peptide spacing increment is 4

Segment 1: 46 peptides starting at residue 1
First peptide: [MAYSTREILL]
Last peptide: [CSYLFISRGR]

Protein sequence: EA-R19~1.ASC (191 residues)

1:	MAYSTREILL	ALCIRDSRVH	GNGTLHPVLE	LAARETPLRL	SPEDTVVLRY
51:	HVLLEEIIER	NSETFTETWN	RFITTHEHVD	LDFNSVFLEI	FHRGDPSSLGR
101:	ALAWMAWCMH	ACRTLCCNQS	TPYYVVDLSV	RGMLEASEGL	DGWIHQQGGW
151:	STLIEDNIPG	SRRFSWTLFL	AGLTLSLLVI	CSYLFISRGR	H

Amino Acid set to be used - AASET1

aaset 1:Free acid L-Fmoc amino acids - DIC/HOBt chemistry

Positive Control Peptide PLAQGGGG

Negative Control Peptide GLAQGGGG

Number of copies of each peptide 2

Schedule based on a 150 microlitre fill/well

(Well concentration is 30 mM)

Details of pins used in the synthesis

Pin Batch No.	.....
Acid level	 microMole
HMD level	 mMole
Beta-Alanine	 mMole

Single block required

GENERAL NET SYNTHESIS SCHEDULE NUMBER : 9

Page

Amino terminus is printed on the left

1 A 1(1,2)PLAQGGGG <
 2 A 2(1,2)GLAQGGGG <
 3 A 3(1,2)MAYSTREILL<
 4 A 4(1,2)TREILLALCI<
 5 A 5(1,2)LLALCIRDSE<
 6 A 6(1,2)CIRDSRVHGN<
 7 A 7(1,2)SRVHGNGLTH<
 8 A 8(1,2)GNGLTHPVLE<
 9 A 9(1,2)LHPVLELAAR<
 10 A10(1,2)LELAARETPL<
 11 A11(1,2)ARETPLRLSP<
 12 A12(1,2)PLRLSPEDTV<
 13 A 1(3,4)SPEDTVVLR<
 14 A 2(3,4)TVVLRVHVL<
 15 A 3(3,4)RVHVLLEEII<
 16 A 4(3,4)LEEIIERNSE<
 17 A 5(3,4)IERNSETFT<
 18 A 6(3,4)NSETFTETWN<
 19 A 7(3,4)FTETWNRFIT<
 20 A 8(3,4)WNRFITHTEH<
 21 A 9(3,4)ITHTEHVDLD<
 22 A10(3,4)EHVDLDFNSV<
 23 A11(3,4)LDFNSVFLEI<
 24 A12(3,4)SVFLEIFHRG<
 25 A 1(5,6)EIFHRGDPSSL<
 26 A 2(5,6)RGDPSSLGRAL<
 27 A 3(5,6)SLGRALAWMA<
 28 A 4(5,6)ALAWMAWCMH<
 29 A 5(5,6)MAWCMHACRT<
 30 A 6(5,6)MHACRTLCCN<
 31 A 7(5,6)RTLCCNQSTP<
 32 A 8(5,6)CNQSTPPYVV<
 33 A 9(5,6)TPYVVVDLSV<
 34 A10(5,6)VVDLSVRGML<
 35 A11(5,6)SVRGMLEASE<
 36 A12(5,6)LEASEGLDGL<
 37 A 1(7,8)SEGLDGWIHQ<
 38 A 2(7,8)DGWIHQQGGW<
 39 A 3(7,8)HQQGGWSTLI<
 40 A 4(7,8)GWSTLIEDNI<
 41 A 5(7,8)LIEDNIPGSR<
 42 A 6(7,8)NIPGSRFSW<
 43 A 7(7,8)SRFSWTLFL<
 44 A 8(7,8)SWTLFLAGLT<
 45 A 9(7,8)FLAGLTLSLL<
 46 A10(7,8)LTLSLLVICS<
 47 A11(7,8)LLVICSYLFI<
 48 A12(7,8)CSYLFISRGR<

GENERAL NET SYNTHESIS SCHEDULE NUMBER : 9

Pa

Bulk solutions for activator and/or additives (96 wells)

Chemistry Group 1 data for synthesis coupling 1

Activator : DIC requires 75.7 mg in 4.00 ml of DMF

Additive 1: HOBt requires 103.6 mg in 15.0 ml of DMF

WEIGHTS FOR INDIVIDUAL AMINO ACID SOLUTIONS

AA #	Amino acid description	Batch	Weight (mg)		DMF (ml)	DIC (ml)	HOB (ml)
			Target	Actual			
A 2	Fmoc-L-Ala-OH.H ₂ O	.....	5.6	.....	0.00	0.11	0.4
D 2	Fmoc-L-Asp(OtBu)-OH	.....	7.0	.....	0.00	0.11	0.4
E 4	Fmoc-L-Glu(OtBu)-OH.H ₂ O	.....	11.7	.....	0.00	0.18	0.7
G 4	Fmoc-Gly-OH	.....	7.8	.....	0.00	0.18	0.7
H 6	Fmoc-L-His(Boc)-OH.5DCM	.....	18.6	.....	0.00	0.24	0.9
I 12	Fmoc-L-Ile-OH	.....	22.7	.....	0.00	0.43	1.7
L 16	Fmoc-L-Leu-OH	.....	29.4	.....	0.00	0.55	2.2
N 6	Fmoc-L-Asn(Trt)-OH	.....	21.4	.....	0.00	0.24	0.9
P 4	Fmoc-L-Pro-OH	.....	8.9	.....	0.00	0.18	0.7
Q 2	Fmoc-L-Gln(trt)-OH	.....	10.4	.....	0.00	0.11	0.4
R 8	Fmoc-L-Arg(PMC)-OH.3IPE	.....	31.5	.....	0.00	0.30	1.2
S 4	Fmoc-L-Ser(tBu)-OH	.....	10.1	.....	0.00	0.18	0.7
T 8	Fmoc-L-Thr(tBu)-OH	.....	18.0	.....	0.00	0.30	1.2
V 8	Fmoc-L-Val-OH	.....	15.4	.....	0.00	0.30	1.2
W 4	Fmoc-L-Trp(Boc)-OH	.....	13.9	.....	0.00	0.18	0.7
Y 2	Fmoc-L-Tyr(tBu)-OH	.....	7.8	.....	0.00	0.11	0.4
					0.00	3.70	14.7

Amino acids weighed by :..... Date:.....

Solutions prepared by :..... Date:.....

Solutions dispensed by :..... Date:.....

Comments:-

GENERAL NET SYNTHESIS SCHEDULE NUMBER : 9

Page

PIN POSITIONS for Synthesis coupling 1

NEW PIN POSITIONS

A 3(1,2) TO A12(7,8)

Well positions for amino acid dispensing

A A 3(5,6)

D A 9(3,4)

E A 8(1,2) A11(5,6)

G A12(3,4) A12(5,6)

H A 7(1,2) A 8(3,4) A 4(5,6)

I A 4(1,2) A 3(3,4) A11(3,4) A 3(7,8) TO A 4(7,8) A11(7,8)

L A 3(1,2) A10(1,2) A 2(3,4) A 1(5,6) TO A 2(5,6) A10(5,6) A 7(7,8)

N A 6(1,2) A 6(3,4) A 6(5,6)

P A11(1,2) A 7(5,6)

Q A 1(7,8)

R A 5(1,2) A 9(1,2) A 5(7,8) A12(7,8)

S A 4(3,4) A10(7,8)

T A 5(3,4) A 7(3,4) A 5(5,6) A 8(7,8)

V A12(1,2) A10(3,4) A 8(5,6) TO A 9(5,6)

W A 2(7,8) A 6(7,8)

Y A 1(3,4)

Appendix 3: Demographic data and anti-EBV serology results of NPC group, using IFA on P3HR-1 and Raji cell lines

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
3002	2	58	4	<5	160	<5	10
3003	1	43	4	10	640	5	40
3004	1	42	4	40	160	10	160
3005	1	56	4	10	640	40	160
3006	1	76	2	5	160	<5	5
3007	1	41	8	5	40	<5	<5
3008	1	60	1	5	160	<5	5
3009	1	21	4	640	5120	40	640
3010	1	55	1	40	640	10	160
3011	1	67	1	160	160	10	40
3012	1	51	2	40	1280	10	160
3013	1	34	2	10	160	5	5
3014	1	57	4	10	640	5	160
3015	1	22	4	160	160	40	40
3016	2	23	4	<5	10	<5	<5
3017	1	74	2	40	1280	40	160
3018	1	51	1	40	1280	<5	40
3019	1	54	1	40	160	160	640
3020	1	66	1	160	2560	160	640
3021	1	50	4	40	1280	10	640
3022	1	30	4	40	640	10	40
3023	1	49	9	40	160	<5	<5
3024	1	58	8	160	1280	160	640
3025	1	55	1	40	640	10	40
3026	1	40	1	10	1280	40	160
3027	2	25	2	160	1280	40	640
3028	1	33	1	160	1280	40	160
3029	1	72	9	10	10	<5	<5
3030	1	47	2	5	160	<5	40
3031	2	39	1	5	160	<5	5
3032	2	53	4	<5	160	<5	10
3033	1	23	4	5	1280	<5	160
3034	1	70	4	40	2560	5	1280
3035	1	49	4	10	160	10	40
3036	1	50	9	160	160	40	160
3037	2	18	4	40	1280	40	640
3038	1	35	1	160	1280	160	160
3039	1	47	4	160	160	10	40
3040	1	36	9	160	160	160	40
3041	2	29	1	160	2560	160	1280
3042	1	35	10	40	640	160	160
3043	1	49	88	40	1280	40	640
3044	2	65	4	160	1280	160	160
3045	1	70	4	5	40	<5	10
3046	1	69	4	40	2560	160	1280
3047	1	84	4	10	1280	10	640

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
3048	2	34	10	10	160	10	160
3049	1	49	2	40	640	40	160
3050	2	61	4	40	640	40	40
3051	1	61	9	640	2560	160	640
3052	1	49	2	10	1280	10	640
3053	1	69	8	10	160	<5	10
3054	1	44	4	10	640	5	40
3055	1	62	1	160	160	10	40
3056	1	44	5	40	640	10	40
3057	1	27	4	640	2560	40	160
3058	1	55	8	40	160	<5	40
3059	1	57	2	40	160	40	160
3060	2	17	4	10	160	<5	40
3061	1	41	1	160	1280	40	160
3062	1	49	4	5	640	<5	40
3063	2	36	1	<5	40	<5	5
3064	1	67	4	160	640	40	160
3065	2	69	4	40	640	10	40
3066	1	47	9	<5	40	<5	5
3067	1	59	5	10	1280	10	40
3068	2	55	2	40	160	10	10
3069	2	51	4	160	640	40	40
3070	1	64	4	40	640	10	160
3071	2	48	2	10	160	5	40
3072	1	69	9	40	160	10	40
3073	1	44	4	40	640	10	40
3074	2	48	4	640	1280	160	160
3075	1	44	4	160	640	10	640
3076	1	45	1	160	640	40	40
3077	1	53	2	40	1280	<5	160
3078	1	33	10	40	640	<5	10
3079	1	49	4	160	160	10	10
3080	2	32	5	10	160	<5	<5
3081	2	31	4	160	1280	160	40
3083	1	30	1	40	640	5	40
3084	1	45	2	<5	640	<5	40
3085	1	49	2	640	1280	160	160
3088	2	54	2	40	2560	5	40
3089	1	52	1	40	160	10	40
3090	2	40	4	10	1280	5	40
3094	2	42	2	1280	5120	640	1280
3103	1	68	4	10	160	5	10
3104	1	42	9	160	2560	40	640
3105	1	44	4	40	640	10	40
3106	1	59	1	640	2560	640	160
3107	2	57	4	40	160	10	10
3108	1	37	1	40	1280	10	160
3109	2	41	4	5	40	<5	10
3110	1	37	1	10	40	10	40

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
3111	1	46	1	10	160	10	160
3112	1	18	9	<5	40	<5	10
3115	1	40	4	10	640	<5	40
3121	1	64	2	160	1280	40	640
3122	1	51	1	10	160	10	40
3123	1	44	4	5	40	<5	10
3124	1	42	1	40	160	10	40
3125	2	33	4	10	160	10	160
3126	1	29	4	40	640	10	160
3127	1	30	4	640	10240	1280	2560
3128	1	45	2	160	640	40	160
3129	1	53	4	10	160	5	160
3130	1	21	4	1280	2560	160	640
3131	1	52	9	640	640	160	160
3132	1	48	1	40	160	40	640
3133	1	52	9	640	1280	160	640
3134	1	69	1	10	160	10	40
3135	1	40	4	160	1280	40	160
3136	1	56	1	160	640	40	640
3137	2	66	2	640	640	640	160
3138	1	71	2	40	640	<5	40
3139	1	43	1	160	2560	160	1280
3140	1	18	4	40	1280	160	640
3141	1	46	4	10	640	40	160
3142	1	38	4	10	640	5	160
3143	1	51	2	40	160	5	10
3144	1	48	1	<5	10	<5	5
3145	1	20	4	40	640	40	160
3146	2	53	4	5	40	<5	5
3147	1	40	4	10	160	<5	<5
3148	1	46	9	160	640	160	640
3149	1	49	1	160	2560	40	640
3150	2	47	4	640	1280	160	1280
3151	2	32	4	10	640	10	40
3152	1	53	2	160	1280	40	640
3153	2	73	9	5	40	<5	10
3154	2	45	1	160	1280	40	640
3155	1	50	2	40	640	5	160
3156	1	70	4	<5	40	<5	<5
3157	1	56	1	10	640	<5	160
3159	1	31	4	10	1280	5	640
3160	1	53	1	640	160	160	10
3161	2	52	10	160	640	160	160
3162	1	17	12	40	1280	40	640
3163	1	40	4	5	160	<5	40
3164	1	58	10	10	640	10	160
3165	2	54	17	10	160	10	10
3166	1	45	4	640	640	640	160
3167	2	64	4	<5	10	<5	<5

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
3168	1	63	9	40	1280	10	640
3169	1	62	9	10	640	5	160
3170	1	66	4	640	1280	40	160
3171	1	69	1	640	160	160	640
3172	1	62	1	<5	10	<5	<5
3173	1	47	4	40	640	40	640
3174	1	40	2	10	160	10	160
3175	1	52	9	40	1280	10	640
3176	1	32	8	10	640	5	10
3177	1	41	16	40	640	40	1280
3178	1	64	1	10	40	<5	10
3179	1	28	4	40	640	40	160
3180	2	47	4	40	160	40	40
3181	1	21	4	10	160	5	10
3182	1	42	1	<5	40	<5	40
3183	1	79	4	640	2560	640	1280
3184	1	71	9	40	2560	160	1280
3185	2	24	4	5	160	<5	<5
3186	2	56	4	<5	160	<5	10
3187	1	36	4	1280	1280	160	160

KEY:

Sex

- 1 : Male
2 : Female

Ethnic
group

- 1 : Chinese
2 : Bidayuh
4 : Iban
5 : Kayan
8 : Kenyah
9 : Malay
10 : Melanau
12 : Punan
16 : Saben
17 : Penan
88 : Not
available

Appendix 4: Demographic data and anti-EBV serology results of non-NPC control group, using IFA on P3HR-1 and Raji cell lines

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
4001	2	60	2	<5	10	<5	<5
4002	2	62	4	<5	10	<5	5
4003	1	42	4	10	5	<5	<5
4004	1	41	4	<5	10	<5	<5
4005	1	59	4	<5	10	<5	5
4006	1	76	2	<5	10	<5	10
4008	1	60	1	<5	40	<5	5
4009	1	24	4	<5	5	<5	<5
4010	1	56	1	<5	160	<5	10
4011	1	65	1	<5	40	<5	10
4012	1	52	2	<5	5	<5	<5
4014	1	55	4	<5	5	<5	10
4015	1	25	4	<5	5	<5	<5
4016	2	26	4	<5	10	<5	<5
4017	1	73	2	<5	40	<5	10
4018	1	54	1	<5	10	<5	<5
4019	1	55	1	<5	10	<5	5
4021	1	51	4	<5	10	<5	<5
4022	1	29	4	<5	40	<5	<5
4023	1	50	9	<5	10	<5	<5
4025	1	53	1	<5	5	<5	<5
4026	1	38	1	<5	10	<5	10
4027	2	28	2	<5	10	<5	<5
4028	1	33	1	<5	10	<5	10
4029	1	74	9	5	40	<5	<5
4030	1	46	2	<5	40	<5	<5
4031	2	36	1	<5	10	<5	<5
4032	2	50	4	<5	40	<5	10
4033	1	22	4	<5	10	<5	10
4034	1	71	4	<5	10	<5	<5
4035	1	48	4	<5	10	<5	<5
4036	1	47	9	<5	10	<5	10
4037	2	18	4	5	10	<5	5
4038	1	35	1	<5	10	<5	<5
4039	1	49	4	<5	5	<5	<5
4040	1	40	9	<5	10	<5	5
4041	2	27	1	<5	10	<5	<5
4045	1	69	4	<5	10	<5	<5
4046	1	70	4	5	10	<5	5
4048	2	34	10	<5	5	<5	<5
4049	1	49	2	<5	10	<5	<5
4050	2	63	4	5	10	<5	5
4051	1	60	9	5	10	<5	5
4052	1	51	2	<5	10	<5	<5
4053	1	67	8	<5	10	<5	<5
4054	1	41	4	<5	10	<5	<5

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
4055	1	64	1	<5	10	<5	5
4057	1	25	4	<5	5	<5	<5
4059	1	56	2	<5	5	<5	<5
4060	2	18	2	<5	10	<5	10
4061	1	42	1	<5	10	<5	<5
4063	2	36	1	<5	5	<5	<5
4064	1	66	4	<5	5	<5	<5
4065	2	71	4	<5	10	<5	10
4066	1	44	9	5	5	<5	<5
4067	1	61	5	<5	10	<5	<5
4069	2	48	4	5	10	<5	10
4071	2	46	2	<5	5	<5	<5
4072	1	67	9	5	5	<5	<5
4073	1	47	4	<5	160	<5	40
4074	2	46	4	5	10	<5	<5
4076	1	46	1	5	10	<5	10
4077	1	51	2	<5	5	<5	<5
4078	1	32	9	<5	10	<5	<5
4079	1	49	4	10	5	<5	<5
4080	2	32	5	<5	5	<5	<5
4081	2	30	4	<5	10	<5	5
4083	1	33	1	<5	10	<5	<5
4084	1	44	2	<5	5	<5	<5
4086	1	49	2	<5	5	<5	<5
4089	1	52	1	<5	10	<5	<5
4090	2	38	4	<5	10	<5	<5
4091	2	77	1	5	10	<5	5
4092	1	45	4	<5	10	<5	5
4095	2	44	1	<5	5	<5	<5
4097	1	47	9	<5	10	<5	<5
4098	1	37	1	<5	5	<5	<5
4102	1	41	4	<5	5	<5	<5
4103	1	68	4	<5	10	<5	10
4104	1	51	9	5	5	<5	<5
4105	1	41	4	<5	5	<5	<5
4107	2	54	4	5	10	<5	<5
4108	1	38	1	<5	5	<5	<5
4109	2	43	4	<5	5	<5	<5
4110	1	34	1	<5	10	<5	<5
4112	1	20	9	<5	5	<5	<5
4115	1	38	4	<5	5	<5	<5
4116	2	63	2	<5	40	<5	<5
4118	1	45	1	<5	10	<5	5
4120	2	80	1	<5	5	<5	<5
4121	1	67	2	<5	10	<5	<5
4122	1	54	1	<5	10	<5	10
4123	1	46	4	<5	5	<5	<5
4124	1	40	1	<5	10	<5	5
4125	2	36	4	5	10	<5	5

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
4126	1	26	4	<5	10	<5	10
4127	1	33	4	<5	5	<5	<5
4128	1	44	2	<5	10	<5	<5
4129	1	56	4	<5	40	<5	10
4130	1	24	4	<5	5	<5	<5
4131	1	52	9	<5	10	<5	<5
4132	1	47	1	<5	10	<5	<5
4133	1	49	9	<5	5	<5	<5
4134	1	72	1	5	40	<5	<5
4135	1	37	4	<5	10	<5	10
4136	1	53	1	<5	5	<5	5
4137	2	67	2	<5	40	<5	10
4138	1	73	2	5	10	<5	<5
4140	1	17	4	<5	10	<5	<5
4141	1	49	4	<5	5	<5	<5
4142	1	37	4	<5	5	<5	5
4143	1	54	2	<5	10	<5	10
4145	1	23	4	<5	5	<5	<5
4146	2	51	4	10	40	<5	<5
4147	1	42	4	<5	10	<5	<5
4148	1	47	9	<5	10	<5	10
4149	1	50	1	<5	10	<5	5
4150	2	46	4	<5	10	<5	<5
4151	2	29	4	<5	10	<5	<5
4152	1	51	2	5	10	<5	<5
4153	2	72	9	<5	5	<5	<5
4154	2	43	1	<5	40	<5	<5
4155	1	47	2	<5	40	<5	<5
4156	1	70	4	<5	160	<5	5
4157	1	56	1	<5	10	<5	<5
4159	1	28	4	<5	5	<5	<5
4161	2	51	10	<5	10	<5	<5
4163	1	41	4	<5	10	<5	<5
4164	1	56	10	<5	10	<5	<5
4166	1	47	4	<5	10	<5	<5
4167	2	62	4	5	40	<5	10
4168	1	63	9	<5	10	<5	<5
4169	1	66	9	<5	40	<5	5
4170	1	64	4	<5	5	<5	<5
4171	1	71	1	<5	10	<5	<5
4172	1	62	1	<5	10	<5	5
4173	1	45	4	<5	5	<5	<5
4174	1	43	2	<5	5	<5	<5
4175	1	54	9	<5	10	<5	<5
4177	1	40	8	<5	10	<5	10
4178	1	61	1	<5	5	<5	<5
4179	1	25	4	<5	5	<5	<5
4180	2	45	4	<5	5	<5	<5
4181	1	20	4	<5	10	<5	<5

CCRID	Sex	Age	Ethnic group	IgA/VCA	IgG/VCA	IgA/EA	IgG/EA
4182	1	41	1	10	40	<5	10
4183	1	79	4	<5	10	<5	<5
4184	1	68	9	<5	10	<5	<5

KEY:

Sex

- 1 : Male
- 2 : Female

Ethnic
group

- 1 : Chinese
- 2 : Bidayuh
- 4 : Iban
- 5 : Kayan
- 8 : Kenyah
- 9 : Malay
- 10 : Melanau
- 12 : Punan
- 16 : Saben
- 17 : Penan

Appendix 5: Statistical Tests (Campbell & Machin, 1999).

Geometric Mean Titre (GMT)

$$\text{GMT} = \text{anti log}_{10} \frac{\sum \log_{10} x_i}{n}$$

$$\sum \log_{10} x_i = \text{summation of } \log_{10} x_1 + \log_{10} x_2 + \dots \log_{10} x_n$$

Mann-Whitney U Test

The Mann-Whitney U test is a nonparametric alternative to the t-test for independent and non-normally distributed samples. This test assumes that variable under consideration was measured on at least an ordinal (rank order) scale. The interpretation of the test is essentially identical to the interpretation of the results of a t-test for independent samples, except that the U test is computed based on rank sums rather than means. The U test is the most powerful (or sensitive) nonparametric alternative to the t-test for independent samples and offers greater power to reject the null hypothesis than the t-test.

The z value was calculated based on:

$$z = \frac{T - n_1(n_1 + n_2 + 1)/2}{\sqrt{[n_1 n_2 (n_1 + n_2 + 1)/12]}}$$

where; n_1 = group size of NPC

n_2 = group size of NHS

T = sum of the ranks for the NPC group

Spearman R Correlation

The correlation coefficient was computed to express a relationship between two variables. The Spearman R correlation coefficient is a nonparametric alternative equivalent to the standard parametric Pearson correlation coefficient. Spearman R assumes that the variables under consideration were measured on at least an ordinal (rank order) scale, that is, that the individual observations can be ranked into two ordered series.

The correlation coefficient (r) was calculated based on:

$$r = 1 - \frac{6 \sum d_i^2}{n^3 - n}$$

where; d_i = the difference in ranks for the i th individual

n = sample size

Sensitivity and Specificity

Sensitivity: the ability of the test to detect the disease (NPC patients)
= true positives / (true positives + false negatives)

Specificity: the ability of the test to detect the healthy (no history of NPC)
= true negatives / (true negatives + false positives)